

# AVIATION

*The Oldest American Aeronautical Magazine*

McGraw-Hill Publishing Company, Inc.



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## You Can Trust IRVIN --the World Does!

This time, it's Australia.

Here the camera has caught *Leut. Ross* of the *Royal Australian Air Force*—a split second—after he has pulled the rip cord of his *IRVIN*, "our the Melbourne Aerobatics."

Note the pilot chute. How—carefully—it has sprung to action. How—carefully—it holds the apex of the main chute out into the line of flight, as *Leut. Ross* moves away from the ship he has just left, thus also safely ensuring the proper deployment of the canopy.

In another instant—the canopy will be fully inflated. *Leut. Ross* will be floating gently—safely—to earth.

### THE PILOT CHUTE

—product of *IRVIN* Engineering, patented by *IRVIN* patents, is just one of the outstanding contributions to aerial life-saving that has made *IRVIN*'s irreplaceable record of more than 500 lives rescued in mid-air. That has given flying the assurance of safety even in the event of unforeseen emergencies.

Every *IRVIN* Air Chute comes from the same integrated lineage. Into it is built the far more than a decade of this world-wide flying and life-saving experience. Back of it is the engineering and inventive skill of a group of pioneers in parachute development devoting their efforts exclusively to producing the safest parachute possible to build.

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# IRVIN

## AIR CHUTES

"The Life-Preserver of the Air"



AUTOGIRO TRAINING OFF FROM PIER 34, NEW YORK, WITH JUAN DE LA CIERVA, DECEMBER 23, 1931 (INTERNATIONAL NEWSREEL PHOTO)

## Prophetic Achievements



(Contd.)

THAT many amazing things are doing almost daily should no longer be appraised as "stunts"—they are practical examples of useful applications of the Autogiro beyond the limitations of previous aircraft.

When an Autogiro landed and took off from the lawn of the White House it was sensational only because it was the White House. Many Autogiros make practical use of the lawns of many estates.

When two Autogiros land and take off from a city street on the Philadelphia waterfront, it is heralded as a "stunt" only because it is the first time a sea captain has been able to use an aircraft to transport

him to his pier. But actually it was a practical demonstration of the feasibility (with adequate provisions) of using Autogiros to land passengers almost at the gangplank of an ocean liner.

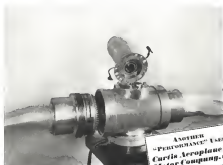
When another Autogiro recently landed on a New York pier to meet Juan de la Cierva, its inventor, upon his arrival from Europe, and took off again with him for Philadelphia, it was merely another demonstration of the ability of the Autogiro to directly break air and water transportation.

Those who are responsible for the success of the Autogiro, value public interest in these demonstrations only as it is translated into an understanding of how vastly the Autogiro extends the practical usefulness of air transportation.

The Autogiro Company of America is an engineering and licensing organization. It owns and controls, exclusively, all Autogiro patents within the United States. Manufacturing companies of high standing will be licensed to build Autogiros with the full cooperation of our engineering staff. Present licensees are: *Bald Aircraft Company, St. Clair, Mich.*; *Eller Aircraft Corp., Philadelphia, Pa.*; *Private Aircraft, Inc., Willow Grove, Pa.*; *F. W. Stearn Company, Bar Harbor, Maine, N. Y.*

# AUTOGIRO

# DEMANDED... FOR SKF'S HAVE KNOWN DEPENDABILITY



ANOTHER  
"PERFORMANCE" TALK  
Curtis Aeroplane &  
Motor Company, Inc.

## WHERE PERFORMANCE TAKES PREFERENCE OVER PRICE

DEPENDABILITY...the decision sought in aviation. Nothing takes its place. This is true of every piece of equipment...and that most certainly means bearings. Year after year, SKF Bearings have been meeting this all-important requirement without any slips. It is this assurance of known reliability that accounts for the use of seven SKF Ball Bearings on the Curtis Control-able Pitch Propeller.



Every hour in the air, SKF Ball Bearings prove their ruggedness and smooth running qualities. Close tolerances are maintained as SKF's show no wear...and no adjustment. And above all there is that feeling of utmost confidence...SKF's won't let you down. No wonder SKF Performance Takes Preference Over Price with leaders in the aviation industry.

You may find a bearing and bearing hat try and get the same sized bearing as for nothing is apt to give in such as a bearing that run on SKF.

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# SKF

Ball and Roller Bearings

ON THE AIRWAYS TODAY  
as on the highways!  
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"Guaranteed  
Forgings"

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Worcester, Mass. and Harvey, Ill.

# When Larger Planes Fly...

AIR transportation has already established a tradition and a record. We are able now to deal with something more tangible than prophecy. We know that when a plane takes off, it is going somewhere, usually with paying passengers or valuable cargo, guided along its way by professional operators and scientific equipment. It figures in important statistics both as an industry and as an accepted means of dependable rapid transportation.

Where does aviation go from this point?

In all probability it will continue as it is going now, simply extending its range, improving its material, becoming more efficient in all its activities to meet the needs of a world that looks to it seriously to solve many modern problems. Its chief advance will be in dimension. Larger planes will have to be built to accommodate larger numbers of travelers at lower cost for transportation. Larger planes must mean greater mechanical efficiency and lower proportionate operating costs.

The great success of the Ford tri-motored, all-metal plane, which pioneered the airways, plainly indicates the future Ford. Larger Ford planes will soon lead the way.

FORD MOTOR COMPANY

AVIATION  
FOR MARCH, 1932  
Statistical Number



## The aircraft industry reads its future in the figures

THIS is the latest statistical issue of AVIATION. A number of points are here covered for the first time—none of them we believe, for the first time in the history of American aeronautics. The problem of preparing such a compilation grows more acute as the sources grow more varied and scattered, but the usefulness of the result ought also to be steadily increasing. It is possible to learn a great deal by a comparison with the record of just years that could not possibly be drawn from any single study, however complete.

There are a few features to which we want to invite special attention, because of our conviction that they deserve it, and that the information set forth and the conclusions drawn are of considerable importance and immediate use to the operators and manufacturers of aircraft in making their current decisions.

Then, for example, the studies of density of passenger traffic and of frequency on air transport lines, particularly the former. They appear on pages 104 and 125. A glance at the maps will show where centers of gravity of public interest lie, and how successful the policies of the various operators have been in developing public patronage.

Of great interest to transport operators, also, is the analysis of governmental expenditures on civil aviation and the relation to the development of

traffic in all the leading air powers of the world, printed on page 136.

Students of plans for military and government officials, and the plain citizen interested in the development of military aviation will find on page 124 what we believe is the most complete tabulation recently published in English of the military and naval activities of all the countries of the world.

For manufacturers far concerned as cost, and for distributors, dealers and operators of flying services we set forth on page 125 an examination based on three successive years of close analysis of all licensed aircraft, not the several quarters of average life and of rate of replacement of machines in various classes of service. It is supplemented by a table, the first of its kind, of the classification of airplane owners and of the types of craft that each group has favored. That appears on page 126.

After pointing with a modest degree of pride to a few of the high spots of the year, there remain two obligations—to make grateful acknowledgments of assistance and to confess the virtual certainty of occasional errors—we hope minor ones. The first obligation is a very pleasant one, indeed. As usual, our principal debt is to the Department of Commerce and the Aeronautical Chamber of Commerce. The Aeronau-

tics Branch, the Aeronautical Trade Division of the Bureau of Foreign and Domestic Commerce, and the Chamber of Commerce have all been helpful in the extreme. They have been generous in passing original material at our disposal, that we might make our own analyses. We are deeply appreciative of the assistance of the National Advisory Committee for Aeronautics, the Army Air Corps, the Naval Bureau of Aeronautics, and a number of other governmental departments and offices; of the unstinting cooperation of the Canadian Director of Civil Aviation and of the information furnished in direct correspondence by some twenty foreign governments—of the efforts of some 700 airport managers and flying service operators in the United States who have responded to our questions about their own activities. The work could not have been done without everyone's help. We hope that those who have helped will find the results of enough interest to justify the trouble that they have taken.

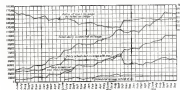
It is impossible to hope that to experience a compilation, necessarily made under great pressure of time, will be entirely free from error. In past years we have been fortunate in avoiding errors having any important effect upon our conclusions, and we hope that we shall be equally fortunate this time. We shall greatly appreciate it if any reader will bring to our attention any slips that he discovers, and we shall be glad to correct in succeeding issues of AVIATION any slip that seems to be of significance.

## Air transport

### How does it progress? And where most rapidly?

THE year just passed has shown no very extraordinary changes in the air transport figures. Passenger mileage increased some 20 per cent, the first year since 1925 in which it has failed to double the previous year's total. Obviously, no such rate of progress as that could have continued for long. Airplane mileage made a slightly larger increase, the average number of passengers per airplane flying as a whole (including those on which no passengers were carried) increasing between two and one half and three. The number of passengers carried increased by 19 per cent. The average load per passenger was therefore about exactly the same as in 1926.

There are no official statistics in the United States which give as accurate basis for the subdivision of the tonnage of mail and express, from an approximate it better than no figures on that point, however, and an approximate notion has been secured by estimating the average distance traveled by the average piece of mail on each mail route at each of the past five years. Equating the tonnage for each year, and assuming as to get a total. It appears that at least approximately the tonnage represented by passenger traffic is about 70 per cent of the total of transport between as far as tonnage is concerned in 1927. For example, 73 per cent of the service, however, passengers as the aggregate furnished the transport has with only about 21 per cent of the tonnage. Roughly speaking, passenger traffic in 1927 was compensated for at 35 cents a ton-mile, mail traffic at \$1 a ton-mile.



Four years of air transport growth



customer months. Operations are, however, much more concentrated and carried on with more regularity than in the summer of 1931. The average actual flow in accordance with schedule has probably increased at least 25 per cent since that time.

#### Frequency of service

Passenger airlines in the United States are still on a five-day-a-week basis in most cases on the map of each page 105 graphically indicates. With a service as infrequent as that, only a relatively few passengers can be caught, those whose desires and other obligations happen to coincide with the airline's schedule. There are only about 3,500 miles in the United States over which more than two round trips per day are offered for passengers. Roughly high frequency is confined to some 1,200 miles of route, well scattered over the country.

There is much less to complain of in respect of air mail frequency (mapped on page 106). It is fairly good, possibly to secure better than was night service on letters in any event, and two or three scheduled a day are generally enough to give the appearance of a fast mail service that could be hoped for under any conditions.

Roughly speaking, three vehicles a day are as good for mail as six or eight are for passenger service over a short route. It is of course natural that the air mail service should show a better load-out, and a more uniform schedule adjustment, than the passenger branch, since the mail lines are all under the general control of the Post Office Department and can be planned as a whole. Most of the first-class trunk lines have now at least two vehicles a day and many of them have three.

#### Passengers per route

ON the lower part of page 102 (captioned as before) is to be found the first analysis of volume of air passenger traffic that has ever been prepared in graphical form for the United States. It has necessarily been based only on the first six months of 1931, the figures for the last half not yet being available, but a map for the whole year would show no great changes except for considerable increases in density of traffic between Cleveland, Detroit, and Chicago, and between Los Angeles and San Francisco.

The facts in which reports are new made to the Department of Commerce makes it impossible to divide the traffic accurately in respect to the individual parts of the various lines. It has been necessary, for example, to assume that the travel on the Boeing line is uniformly divided from Chicago to San Francisco. The weight of the line on the map, however, is not based simply on the total number of passengers flying over some part of the line. The difference is made for the fact that many of these travel only a limited part of the total length. The figure of passenger miles rather than that of total passengers, has been used as a basis of calculation, and the only remaining error is in the assumption that a T&W A, for example, there are just as many passengers on the aggregate on the stretch between Kingston and Albuquerque as between San Louis and Colorado. While some error is involved in such an assumption, it is not believed that it is very serious, so that it is at all appreciable except in a few cases. It doubt other errors have crept in at some points. The general character of such a map, however, is not in its exact numerical interpretation, but in that it permits the gaining of a general idea of the general pattern of service and where which territories are being best supplied. This presentation on page 105 will, we believe, prove substantially right for that purpose.

The width of the lines on the map could not be made directly proportional to the volume of traffic where the traffic was very heavy, as it would have required thickening to so large a part of the map as to be very obscure. The weight of the line used for any number of passengers up to ten per day is indicated on the map itself. Revised this was made proportional to the square root of the number of passengers, for lines for 50 passengers or more. For example, being three times as wide as that for ten. The individual routes and points of routes having the heaviest traffic are:

Route	Per cent of total
New York-Boston	10
New York-Chicago	9
New York-Detroit	8
Chicago-Chicago	7
Chicago-St. Paul	6
St. Paul-Minneapolis	5
Los Angeles-San Francisco	4
San Francisco-San Diego	3

There has been a general falling off in traffic on the routes that were most popular in the early part of 1931, such as Cleveland-Detroit and Los Angeles-San Francisco, and new favorites like New York-Washington and New York-Chicago have come to take place among the leaders. It appears, however, that that trend in some instances being reversed, the traffic between Los Angeles and San Francisco rose to a high of 50 passengers per day average over the last half of 1930 and dropped to one-third of that figure in the next six months. Since then, two new lines have been started, and there has been a decided improvement in traffic. Whether or not it has yet regained the level of capacity, much can be said yet to be determined.

#### Passengers carried per day

Line	Passengers carried per day
New York-Boston	110
New York-Chicago	100
New York-Detroit	90
Chicago-Chicago	80
Chicago-St. Paul	70
St. Paul-Minneapolis	60
Los Angeles-San Francisco	50
San Francisco-San Diego	40

Aside from the extraordinarily light passenger traffic on many of the lines which have long been in operation, perhaps the most surprising feature of the map is the heavy movement of passengers to the north. Only one or eight routes in the United States exceed that between Miami and Elmore in the number of passengers carried per day, and the line from Minneapolis to Denver City runs well up above the majority



the unduly heavy line Chicago to St. Louis and Kansas City to Dallas and Galveston, that northern line Chicago to the Twin Cities, and the route between San Francisco and Los Angeles, include all the operations in the country that average more than 50 passengers per day in the first half of last year.

A comparison of traffic for the same period in the previous year has been made for a few of the major routes.

#### Average number of passengers (carried daily)

Route	1931	1930
New York-Boston	110	100
New York-Chicago	100	90
New York-Detroit	90	80
Chicago-Chicago	80	70
Chicago-St. Paul	70	60
St. Paul-Minneapolis	60	50
Los Angeles-San Francisco	50	40
San Francisco-San Diego	40	30

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of those in the continental United States in traffic density.

On the whole, the extreme concentration of traffic on a few routes is the result of many factors. What has been done in a few routes can, in the course and with more or less similar methods, be done elsewhere. With an average of 172 passengers each day between New York and Washington it is ridiculous to suppose that 50 on the Cleveland-Detroit run, or 20 between St. Louis and Chicago, need represent anything but a small part of the business. Still more absurd are the lines on the map showing one or two passengers a day between a number of points, both east and west, of crowded traffic possibilities.

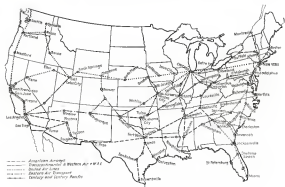
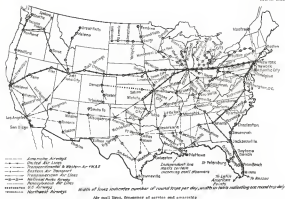
#### Group ownership

THE map on page 104 showing ownership and frequency of operation of many air mail lines and passenger lines of passenger lines, split for themselves. In the case of the passenger lines only the two operators who operate a number of routes in the United States each day have been included. The passenger map is particularly striking as a reminder that, although the Government has been effective in eliminating most of the direct competition among the major operators for passenger business, there remains a vast

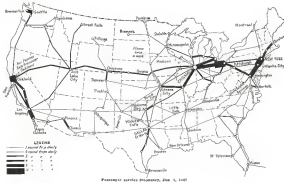


Development of air passenger traffic (Chicago to New York)

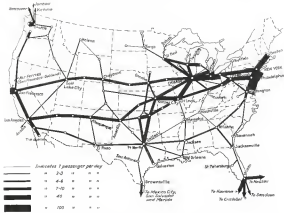
amount of indirect competition. There is only a few instances in which two lines run in direct parallel from one city to another, but in many cases, particularly in the eastern and northern parts of the country and on the transcontinental routes, it is possible to travel between two cities 600 miles or more apart by two or three routes not differing by over 20 per cent in mileage. It is sometimes the case that the total distances to be covered from starting point to ending point are very similar, but the "short" air routes are more nearly the same than are the distances of the two railroads most directly competing over the same route.



Passenger operations of the five groups of companies having the largest scheduled daily service



Passenger service frequency, Jan. 1, 1931



Average density of passenger traffic, but not of U.S. (Thick lines indicate air passenger traffic, not passenger in each direction)

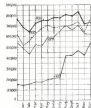
## Air mail

## The Waters Act in its workings



AIR MAIL operations and traffic during 1932 followed a course in decided contrast to the general trend of business for the year. An increase in scheduled mileage in great measure was due during the two preceding years in 1930 and 1931. Most of the increase was due to increased frequency of service on long-established routes, such as the New York-Chicago-San Francisco. A number of new routes, most of them short, were opened. After the mail drop in February the rise was interrupted until the suspension of several summer services in September closed a slight up-luck. An air mail compression resulted a new high in August, but promptly fell again, weather during the last two months of the year reduced the gain.

Minor fluctuations in the curves are frequently due to the varying lengths of the months. February is shown a half month because it starts with a 10 per cent holiday at against January



General variation of air mail production (one million miles) since 1918



1931 and 1932 have grown steadily

October, falling in between two 36-day stretches, always looks relatively good.

## Rate of traffic increase

The curve of air mail production continued to rise steadily at a moderate rate throughout 1931 with only the apparently unavoidable drops which have occurred in February and November for the past four years. Fluctuations in increase are much more evident in the seasonal chart. The curve for 1931 indicates a position well above any preceding year for every month except December. This is only the second instance in four years where the monthly total does not show an increase over the figure for the same month of the preceding year, and it suggests that Christmas shipments, many of them sent by air mail only for the sake of novelty, are playing a diminishing part. Monthly increases ranged up to 35 per cent above the corresponding 1930 levels. The total production shows during 1931 exceeded 1930 by more than 12 per cent, while total payments to contractors were 35 per cent greater than during the previous year. It would be difficult to find an equal to this increase in the general business activities of the year 1931.

The curve of average compensation per pound carried, comparing with that for scheduled mileage in respect of its climb during the year is unfortunately of relatively negligible interest. Numerous new schedules and better routes carried only small mail loads, account for the recent rise in paid

compensation. Income per mile a more adequate financial gauge, has dropped steadily to a point below the base of its phenomenal rise in June of 1930, when air mail rates were first reduced.

At the end of 1931 the general average is lower than at any time in the previous three and a half years.

## Falling income per mile

The review of rates that the Post Office Department made on Jan. 1 will produce another sharp drop, probably to below 60 cents a mile. Although it is not so badly hit the peak figure of



Percentage of income per mile, per mile and per pound

## Mail carried by routes for 1931

	Actual	Actual	Percent of	Total weight of mail	Average weight per	Average amount paid	Average rate per
	carried	carried	actual	carried	lb.	per lb.	lb.
<b>Atlantic Airways</b>							
1 Boston-New York	16,000	202,362	80.1	1,012,200	12,000	\$0.12444	88.18
2 Boston-Buffalo	24,000	14,871	49.8	1,360	14	\$0.02186	89.48
3 Chicago-Buffalo	43,000	4,122,441	95.5	4,279	42,700	\$0.12444	88.18
4 New York-Tulsa-Wichita	1,151,432	1,128,205	99.8	30,000	10,000	\$0.12444	88.18
5 Dallas-Chicago	24,940	225,225	90.1	2,000	24,000	\$0.12444	88.18
6 Dallas-Fargo	44,000	10,000	90.5	1,000	10,000	\$0.12444	88.18
7 Atlantic-New Orleans	35,000	247,000	95.9	10,000	10,000	\$0.12444	88.18
8 Chicago-Chicago	40,000	211,000	90.2	1,000	1,000	\$0.12444	88.18
9 New Orleans-Fargo	25,000	10,000	90.4	1,000	1,000	\$0.12444	88.18
10 Omaha-Salt Lake	1,141,200	1,229,500	90.7	3,000	3,000	\$0.12444	88.18
11 Atlantic-New York	1,015,000	1,015,000	90.6	20,000	20,000	\$0.12444	88.18
<b>Transcontinental Airways</b>							
12 New York-Chicago	324,000	1,015,000	90.2	1,015,000	1,015,000	\$0.12444	88.18
13 New York-Chicago	1,015,000	1,015,000	90.2	1,015,000	1,015,000	\$0.12444	88.18
14 New York-Chicago	1,015,000	1,015,000	90.2	1,015,000	1,015,000	\$0.12444	88.18
15 New York-Chicago	1,015,000	1,015,000	90.2	1,015,000	1,015,000	\$0.12444	88.18
16 New York-Chicago	1,015,000	1,015,000	90.2	1,015,000	1,015,000	\$0.12444	88.18
17 New York-Chicago	1,015,000	1,015,000	90.2	1,015,000	1,015,000	\$0.12444	88.18
18 New York-Chicago	1,015,000	1,015,000	90.2	1,015,000	1,015,000	\$0.12444	88.18
19 New York-Chicago	1,015,000	1,015,000	90.2	1,015,000	1,015,000	\$0.12444	88.18
20 New York-Chicago	1,015,000	1,015,000	90.2	1,015,000	1,015,000	\$0.12444	88.18
21 New York-Chicago	1,015,000	1,015,000	90.2	1,015,000	1,015,000	\$0.12444	88.18
22 New York-Chicago	1,015,000	1,015,000	90.2	1,015,000	1,015,000	\$0.12444	88.18
23 New York-Chicago	1,015,000	1,015,000	90.2	1,015,000	1,015,000	\$0.12444	88.18
24 New York-Chicago	1,015,000	1,015,000	90.2	1,015,000	1,015,000	\$0.12444	88.18
25 New York-Chicago	1,015,000	1,015,000	90.2	1,015,000	1,015,000	\$0.12444	88.18
26 New York-Chicago	1,015,000	1,015,000	90.2	1,015,000	1,015,000	\$0.12444	88.18
27 New York-Chicago	1,015,000	1,015,000	90.2	1,015,000	1,015,000	\$0.12444	88.18
28 New York-Chicago	1,015,000	1,015,000	90.2	1,015,000	1,015,000	\$0.12444	88.18
29 New York-Chicago	1,015,000	1,015,000	90.2	1,015,000	1,015,000	\$0.12444	88.18
30 New York-Chicago	1,015,000	1,015,000	90.2	1,015,000	1,015,000	\$0.12444	88.18

1 Unpublished Jan. 1, 1932. 2 Unpublished Jan. 1, 1932. 3 Unpublished Jan. 1, 1932. 4 Unpublished Jan. 1, 1932. 5 Unpublished Jan. 1, 1932. 6 Unpublished Jan. 1, 1932. 7 Unpublished Jan. 1, 1932. 8 Unpublished Jan. 1, 1932. 9 Unpublished Jan. 1, 1932. 10 Unpublished Jan. 1, 1932. 11 Unpublished Jan. 1, 1932. 12 Unpublished Jan. 1, 1932. 13 Unpublished Jan. 1, 1932. 14 Unpublished Jan. 1, 1932. 15 Unpublished Jan. 1, 1932. 16 Unpublished Jan. 1, 1932. 17 Unpublished Jan. 1, 1932. 18 Unpublished Jan. 1, 1932. 19 Unpublished Jan. 1, 1932. 20 Unpublished Jan. 1, 1932. 21 Unpublished Jan. 1, 1932. 22 Unpublished Jan. 1, 1932. 23 Unpublished Jan. 1, 1932. 24 Unpublished Jan. 1, 1932. 25 Unpublished Jan. 1, 1932. 26 Unpublished Jan. 1, 1932. 27 Unpublished Jan. 1, 1932. 28 Unpublished Jan. 1, 1932. 29 Unpublished Jan. 1, 1932. 30 Unpublished Jan. 1, 1932.

the winter of 1929-30, and a third lower than in the year when the Waters Act was passed to get the air mail business on a sounder footing. The average response to the mail contractors, per mile flown was 17 per cent lower in 1930 than in 1929, and 20 per cent lower in 1931 than in 1930.

The reason for the decline in the average response to the mail contractors, per mile flown was 17 per cent lower in 1930 than in 1929, and 20 per cent lower in 1931 than in 1930. The reason for the decline in the average response to the mail contractors, per mile flown was 17 per cent lower in 1930 than in 1929, and 20 per cent lower in 1931 than in 1930.

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Comparisons of traffic and compensation in scheduled mail routes between 1930 and 1931 are complicated by the numerous extensions and consolidations. However, an enabling basis for comparison has been achieved by taking the 1930 figures for the two

routes which became one during the past year, as for instance the New York-Albany and Albany-Saratoga routes which are covered by Route 29.

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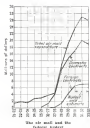
## Revisions of traffic

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land, in extractions of roots and con- sideration with other nations in a treaty. These are the grounds covered.

However, these traffic increases are observable in routes such as the Chicago-Dallas, Boston-New York, and Seattle-San Diego, substantially the same during the past two years, while only eight routes showed any decrease. These were of more than 12 per cent on the single instances of the Salt Lake-San Diego route, which felt keenly the competition of the two new lines, commercial runs established here in 1930. That the drop should not be lost to any degree in West Coast interest in air transport is evidenced by the record of the Seattle-San Diego route which in 1932 carried 38 per cent more mail than it carried during the previous

The four largest operators accounted in the aggregate for 80 per cent of the mail postage flown, but received only 85 per cent of the total compensation. Their average pay per pound was only three-quarters of the average for the five smaller companies holding mail contracts.

#### Evaluation of service

(also also shared on one of pages 888)

Regularity of air mail service, as reflected by the ratio of successful flights to scheduled schedules, showed a slight change from 1930 figures. Slightly better than for any year since 1905, the current ratio is still below the level at which it was maintained when the air mail was under government operation and when there was little or no night flying. Consideration for passenger comfort and safety on the increasingly larger number of routes and for the more exacting requirements for this condition, yet it is surprising that all the work done on blind flying in the last few years has not yet shown more definite effect on the reliability



degrees. Since favorable flying weather and topography serve to promote higher percentages of regularity in some parts of the country than in others. However, the Great Salt Lake City and Chicago-Denver routes, to mention two passenger-mail routes which are handicapped by average weather conditions and terrain, achieved records of regularity of over 96 per cent, exceeding those of the days of government operation. Also, two of the dirtiest routes scoring over 95 per cent regularly carried passengers as well as mail.

### Accident rates

**I**N SPITE of two very dramatic in-flight loss accidents, in each of which a number of lives were lost, the safety record of American aviation was better in 1984 than in any preceding year.

There is a great deal of argument about the best way of presenting accident statistics. Sometimes they are given in tabular form, as in the table above, which is clear, since it counts a twenty-passenger aircraft and a five-passenger machine as equal. Another commonly used method is to give accident deaths in terms of numbers of passengers flown, which is better, but not good, for it assumes that the hazard of a three-passenger trip is no greater than that of one across the Great Sand. The only really accurate figure for passengers board is the number of fatalities per 1,000,000 passenger-miles. That is it.



one figure that tells the traveler by no means small are his chances of being killed or injured in a serious traffic accident or injury given amount of flying. On that basis the passenger death rate on transport lanes in 1938 was 10 per cent lower than in any previous year. As will be noted from the table on page 136, the American accident record in recent years is distinctly better than that of any European country except the Netherlands.

*Increasing sales before records*

Pilot hazards have been studied from two points of view. First, the death rate among transport pilots has been expressed in terms of millions of miles flown. The pilot rate just about equals the best record of any previous year. In the last two years there has been surprisingly little difference between the fatality rates for passengers and for pilots, considering that the pilot figure includes a large amount of mail flying at night or in bad weather, where no passengers are carried because (1) is considered too dangerous.

The used system of rating pilot hazards is the one favored by the insurance companies. It calls for the determination of a straight death-rate, per cent of exposed personnel killed per year. That curve of course includes all pilots, private and professional, not merely those who fly for a living. It is a very rough, but usable, approximation. The general safety of flying for the whole body of pilots shows an increase of 50 per cent over the best previous record, and about 260 per cent over 1926. Even if allowances be made for about 5,000 pilots who do not fly civil aircraft with any frequency, the average death-rate among those actively engaged in civil flying is about 10 per cent of the 1926 figure.

It is believed that the general practice of life insurance companies in requiring additional loadings on the premiums for policy holders engaged in aviation is based on an assumption of a considerably higher special aviation hazard than those figures shown to exist.



AVELTON  
March 1931



### Airports and airways

*How many miles to the nearest field—and what's being done there?*

**AIRPORT** construction is a constant with administrators, especially in the

For the first time, the rising negativity about overall and municipal debts has been an increasing at an almost constant rate of 200 per cent per year. Furthermore, the two largest counties continue to grow negative. The two largest counties are the largest of the 1998 spent in municipal airport construction, largely due to the Lindbergh airport, had reduced the commercial fields slipped into the "red." They still, largely, are in the "red" and are likely to remain in the "red" in the coming year. It is encouraging to find that in spite of hard times, and all unfavorable financial reports from many of the emerging airports, capital can still be found for the airports.

At the same time it has become evident from a survey conducted by Aviation, and reported on page 114, that a considerable number of these airports are in fact financially negative. For the country as a whole, it is probable that about 13 per cent of the airports are that way in name. Some of them are in the "red" and some are only marginally

fields with no permanent facilities for storage or servicing. The number of parts in really fit condition probably is somewhere around 1,000.

The intermediate fields of the Department of Commerce and the market auxiliary fields have both shown good increases during the past year, the

**Keywords:** demand; stress; coping

The map which is provided herewith, showing the geographical distribution of American airports, shows a more or less satisfactory situation in the north



Status of airports and landing fields by states, Jan. 1, 1937

[illegible]







## Finance

## A curtailment of losses

Proposed by J. B. Davis

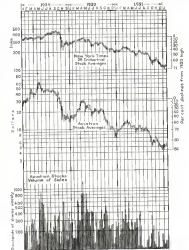


THE outstanding feature of aeronautical earnings during the year 1931 has been the marked curtailment of losses. A study of the tabulated earnings as the accompanying page discloses a reduction of some 60 per cent in total losses suffered during 1931, as compared with the preceding year. The relative position of the industry, from the standpoint of total earnings when compared with general industry,

is naturally small, but when viewed from the standpoint of relative earnings the aeronautical industry presents a far more favorable picture. Of the eight major companies comprising the Aviation Stock Averages only three were able to show a net profit for 1931, as against four showing a net profit during 1930. The total aggregate losses of this group approached \$15,000,000

## Financial record of representative aeronautical companies

Name of company	Division of industry	Stock of 1931 (thous.)	Per cent	Value	Deposited when offered	Market High Low	Dividend	Dividend rate (per cent)	Year	Earnings	
										1931	1930
Aer Macaulay, Inc.	Aircraft	25	100	11.00	C	13 1/2 10 1/2	—	—	1931	225,438	262,019
Albion Aircraft Corp.	Aircraft	50	100	11.00	C	13 1/2 10 1/2	—	—	1931	135,541	1,077,171
American Airlines	Aircraft	100	100	11.00	C	13 1/2 10 1/2	—	—	1931	1,077,171	1,077,171
Boeing Aircraft	Aircraft	100	100	11.00	C	13 1/2 10 1/2	—	—	1931	1,077,171	1,077,171
Boeing Aircraft	Aircraft	100	100	11.00	C	13 1/2 10 1/2	—	—	1931	1,077,171	1,077,171
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Boeing Aircraft	Aircraft	100	100	11.00	C	13 1/2 10 1/2	—	—	1931	1,077,171	1,077,171
Boeing Aircraft	Aircraft	100	100	11.00	C	13 1/2 10 1/2	—	—	1931	1,077,171	1,077,171
Boeing Aircraft	Aircraft	100	100	11.00	C	13 1/2 10 1/2	—	—	1931	1,077,171	1,077,171



Movements of earnings, and volume of trading in leading securities

Price movements, 1929 and 1931

AT A. T. and Western Air Express was today the capital stock of Transcontinental and Western Air, Inc. A share represents one of the stock reports are not available.

\*Compiled by Charles Wright

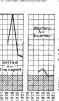
Religious priority



In 1931 an amount \$6,000,000 for 1931, while the total aggregate price received substantially the same as during the year previous. For this group of representative companies the ratio of dollar loss to dollar gain stood at 3.75 to 1 in 1930 as against about 1.75 to 1 in the year just passed. Negative as these results must well appear, they at least disclose encouraging signs of fundamental improvement that should not be overlooked.

The following comparisons bring out some interesting relative changes:

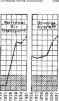
Financial record of representative aeronautical companies



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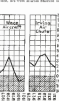
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portion back from the groups to total number built, certified only by the light plane power plants. Their relative position was stronger in 1931 than in 1930.

A more consistent tendency is shown by the high-powered engines. The continued production of that group has been dropping steadily for three years. In 1929 engines of over 200 hp had 25 per cent of the total production in makers. In 1930 they dropped to 22 per cent, and in 1931 to 15.

Prices show no very consistent tendencies. The general average of about \$15 per horsepower continues to rule through the whole power scale. The only really notable and persistent trend is in the falling prices in the 150 hp class, where the average unit price is down 30 per cent from the high level of 1929.

Military production continues to play a dominant part in the engine business, the more so because military and commercial engines are more nearly alike, and their production is more closely intermingled, than is possible with air-

craft. In 1929 military business called for only 32 per cent of the total engine production in dollar value. In 1930 the military share was up to 43 per cent, and in 1931 to 71 per cent. The total volume of military business was almost exactly the same as in the previous year.

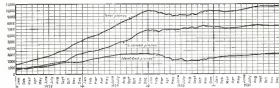
#### Classification by capacity

Full purposes of comparison the production report of the Department of Commerce is given (at the left-hand side of page 159) along with that from the Chamber. The two differ in that the reports of the Chamber of Commerce come only from established manufacturers, while Department of Commerce figures include every unit—airplane that is licensed as identified, and so take into account all of the amateur construction. They coincide, however, such as built for immediate export. The governmental figures have been used in plotting the curve on page 119, which is intended to cover the total number of airplanes built in the United States, but for most purposes the

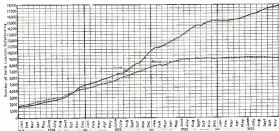
analysis made by the Chamber of Commerce serves better.

#### Seasonal curves

In the seasonal production curve the Chamber's figures have been used. Records have now been kept for four years, and have furnished enough data to plot a normal curve of seasonal distribution of production. It has been included on the chart. The statistics for which this season's curve is actually drawn correspond to a total production of 2,000 planes for the year. Both 1929 and 1931, especially the former, as will be observed from the graph, have started much stronger than they finished. Throughout the spring and the early part of the summer the 1931 production curve followed closely the normal seasonal curve for a total production of 2,000 planes, but as the last four months it fell away badly. This falling away towards the end of the year is of course what would be expected with the general business depression still sitting heavily across and all industry showing a downward tendency.



How the total numbers of airplanes certified in the United States have increased



The gliding personnel grows steadily—total number of licenses outstanding

#### License trends

THE total number of places available in service in the United States has increased very slightly in the past year. After a long period (nearly months) during which the total number of licenses and identifications hovered between 9,000 and 10,000, it has moved up into a new range and stabilized again at between 10,000 and 11,000. Most of the increase in 1931 has been due to the identified planes, licensed machines showing a change of only about 300. It seems very probable from a variety of evidence, including detailed counts of certain groups of airplanes around important centers of activity, that the official figures for identified airplanes are actually considerably the number of such machines that are in service. Identification numbers do not have to be renewed periodically, and the machines require no periodic inspection, so there is no way of being sure that they will be removed from the records in case of destruction or abandonment. Although the graph indicates 9,700 licensed planes and 3,100 identified at the end of 1931, it is probable that about 2,100 and 3,400, a total of 5,500, would more closely represent the number of places actually fit for use on the last day of the year.

On the face of the record as published, in spite of many state laws requiring Federal licensing of all planes, it would appear that very little progress is being made toward the elimination of the unlicensed craft. Never yet have the identified planes in the Department of Commerce records made up less than 20 per cent of the total.

#### Pilots and mechanics

The curve of pilot licenses in June is again encouraging. Although the slope has been less steep for 1931 than in previous years, the trend is still steadily upward.

The number of licenses outstanding increased by 5,500 in 1930, by 5,300 in 1929, 5,100 in 1928, and 2,400 during the past year. It is a little surprising to find that the seasonal tendency in the curve is becoming more and more erratic. In 1931 the beginning of the curve has been very marked, and two-thirds of the total gain for the year was made in five months, from May to September inclusive.

The distribution of pilots among the various states, as well as their geographical distribution, is discussed on page 128.

The ratio of licensed pilots to licensed and identified airplanes has continued to increase almost steadily. Two years ago it was almost exactly unity. Last year the ratio had increased to 1.5, and now it stands at 1.65. If allowance be made for the identified planes that are presumed not to be in flying condition, there are probably more than



Population per hundred airplanes (by state)

two pilots to each plane actually fit to use. Obviously, a very large number of the licensed pilots, probably not less than 4,000, have no regular access to an airplane and are keeping up their flying only in a very dissipated fashion.

The number of licensed mechanics is even more closely inflated than the number of places in service. For airplane mechanics it has never gone outside the range between 9,000 and 9,500.

#### Student permits as an index

THE curve of distribution of new student permits issued is the best record of current public interest in aviation. The curve of new pilot licenses covers the same quantity, with a time lag of from four months to a year. Very curiously, therefore, the student permit rate reached its high in the late summer of 1929, while the peak on the pilot license curve is the early summer of 1930.

On the whole, the curves for 1931 have held up very well, especially on students, the total number of permits issued for the year being only about 2,000 below that for the previous year. The pilot curve was almost uniformly all over except from that of 1930 in every month, seldom varying more than 2 or 3 per cent from that level.

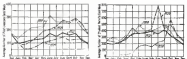
Both the curves for student permits and those for pilot licenses have been

accurately to a constant shape, and partial returns therefore serve as good for prediction. Approximately 20 per cent of the student permits for a year are taken in the first three months.

#### The West grows air-minded

THE West continues to be the region of greatest density of airplane ownership. Of the nine states having the highest average of per capita ownership, seven are west of Kansas City. Only tiny Delaware is able to represent the East.

The strongest geographical tendency that the map reveals, however, is the sparsity of airplane ownership in the Southeast. Florida is a special case, most of the places registered there being in some way connected with the state's popularity as a winter resort. Leaving Florida out of account, there is a solid block of ten states, including everything to the south of the Mason-Dixon line and east of the Mississippi river, and also Arkansas to the west of the river, that have less than one plane for every 30,000 people. Their average density of ownership is less than one-quarter that of California or Delaware. On the other hand, as noted on page 128, it is in the Southeast that some of the largest and most active flying fields are to be found.



Pilot license (July) and student permits (July) steady trend each month for four years







services were operating two years ago, have now almost disappeared. Of the 391 single-engine, two-passenger capacity or larger, which are now licensed, the dealers and flying services held only 14, while the transport companies held 376. Three-quarters of the total number.

The type plan is still more dominant among the machines owned by flying

clubs, making up 82 per cent of the total, making 14 per cent of light aircraft.

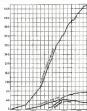
Analysis of the tables of age, type, and ownership shows a general parallelism with the general table on page 127. It has already been noted that 146 of companies have done very little flying, but that non-aeronautical corporations of other types, such as the other

kind, have made relatively heavier purchases in 1931 and 1932 than in 1928. Most seriously affected of all, however, is the dependence of the flying services on old equipment. Out of the 1,735 machines in that group, only 97 per cent were manufactured in 1930 or 1931. It is evident that made by the unsold inventory carried by dealers to meet the number built in the last two years that are likely to see few flying service work, it comes down to about 300 out of 1,735, or 22 per cent. About 75 per cent of the number of machines now owned by flying services for their own use are of 1925 production.

#### Pilots and their distribution

THE most notable change in the record of pilots in the past year, while there was an increase of 10 per cent in their total number, is a further increase in the proportion of private pilots. Two years ago they were only 53 per cent of the total. Last year they were 60. Now they are 63. The importance of the limited aeronautical facilities continues to grow, falling from 10 per cent at the beginning of 1930 to 9 per cent now. Obviously pilots are tending to divide into two widely separated groups. One is made up of those who expect to fly only for pleasure, and who may never bother to take anything more than a private license, however many hours they compile; the other is composed of those who intend to make flying a profession and who go straight through to their transport qualifications as quickly as possible.

The greater total number of pilots are located in California, which increased more of any other state and continues to be the center of the aviation industry in the United States. Even if the effect of the large number of Army and Navy pilots located in California be eliminated, it appears that one-third of every 2,000 civilian owners of their state holds a license of some grade.



Growth appears continues, but a decreased activity is shown in numbers



THE export trade of the American aircraft industry, which is becoming more and more important, during 1931 laid the full force of the world-wide economic depression and dropped to the position which it held two years ago. Of the total production of airplanes, aircraft engines and parts 12 per cent was sold abroad during 1931 as compared with 17 per cent last year and 13 in 1929. Considerable airplanes alone the drop was from 18 per cent expected in 1930 to 6 per cent that year, the figure which advanced in 1931 to the figure of a general industrial decline in 1930 the export trade practically held its own, owing to foreign markets having 6 per cent less than in the peak year of 1929, but during the year just passed the loss was about 50 per cent of the previous year's figure.

A change almost equally striking, though less depressing, has occurred in the nature of the exports. Airplanes, which in 1930 formed 55 per cent, this year made up only slightly more than a third of the total exports. Aircraft engines and accessories accounted for another third of the 1931 total, instead of the 18 and 30 per cent which they had formed respectively of the foreign sales of the previous year. Based on the usual, domestic and other export figures, the export of American airplanes and accessories accounted for another third of the 1931 total, instead of the 18 and 30 per cent which they had formed respectively of the foreign sales of the previous year. Based on the usual, domestic and other export figures, the export of American airplanes and accessories accounted for another third of the 1931 total, instead of the 18 and 30 per cent which they had formed respectively of the foreign sales of the previous year.

#### Europe again our best customer

Among the results of a consideration of the countries of destination of aeronautical exports of the past year is the conclusion of Europe, the largest single purchaser of American aircraft products for the first time since 1926. Asia retakes second place on the list of

suppliers, but South America, last year at the top of the list as the destination of more than 35 per cent of our exports, this year drops to fourth place. Russia, Asia and Europe all continue to have had their effects. The picture of South American purchases of American aeronautical products was somewhat on the pessimistic, especially in 1931, by the

closure of larger numbers of transport planes licensed for use on American airlines on the western continent, licensed in the United States by the Civil Aeronautics Administration. It is nearer to representing true foreign sales. It includes only one large plane, ordered for Chile, and is made up of almost entirely of engine and parts.

## Foreign trade

"What has America to do with abroad?"

### Aeronautical exports

	1929	1930	1931	Total
	Value	Value	Value	Value
<b>Europe and South America*</b>	\$1,715,473	\$1,771,723	\$1,760,000	\$5,247,196
Western and Central America*	\$1,035,680	\$1,035,680	\$1,035,680	\$3,107,040
Europe	1,715,473	1,771,723	1,760,000	5,247,196
South America	1,035,680	1,035,680	1,035,680	3,107,040
Asia	1,035,680	1,035,680	1,035,680	3,107,040
Australia	1,035,680	1,035,680	1,035,680	3,107,040
South Africa	1,035,680	1,035,680	1,035,680	3,107,040
Other	1,035,680	1,035,680	1,035,680	3,107,040
<b>Europe and South America*</b>	\$1,715,473	\$1,771,723	\$1,760,000	\$5,247,196
Western and Central America*	\$1,035,680	\$1,035,680	\$1,035,680	\$3,107,040
Europe	1,715,473	1,771,723	1,760,000	5,247,196
South America	1,035,680	1,035,680	1,035,680	3,107,040
Asia	1,035,680	1,035,680	1,035,680	3,107,040
Australia	1,035,680	1,035,680	1,035,680	3,107,040
South Africa	1,035,680	1,035,680	1,035,680	3,107,040
Other	1,035,680	1,035,680	1,035,680	3,107,040

\* Includes exports to all countries except those in the column not included in the breakdown of items of South Africa.

\* Includes others only

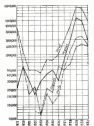
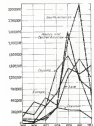
Mexico and Central America, our most reported customer at the time of the initiation of air transport systems in those regions in 1979, now occupy third place in the continental ranking.

## Canada imports 80% from U.S.

In this case, in respect to individual countries, to consider the records for several years in order to ascertain the extent of a few large sales. Russia, the U.S.S.R. and the Soviet Union purchased 153 automobiles from 1950 through 1954, but the records do not indicate whether they entirely canceled over a two-year period. Canada has a reputation as our best customer, with Mexico next, also on record. China, Peru and Soviet Russia are next in order. According to the 1955 records, however, China is far and away the biggest buyer. Mexico consistently second, while Soviet Russia, whose purchases of engines and parts only, were larger than ever before, not excluding

In the early years before a native automotive industry had been developed, third place, Canada, is fourth to 1951, with the United Kingdom and the Netherlands, neither of which marks high on the list. Among the emerging nations, the United States is the only one. The establishment of an overseas branch by Ford in England is responsible for the increase in exports to England, while the use of American engines in Polish airplanes of course accounts for the Dutch total. Again, according to the records of these years, Argentina, Brazil, Japan and Panama are the only countries to show a decline in 1951 while it had dropped to third place in 1950. The Philippines, the Philippines, and the Philippines, and was followed by Argentina, Panama and Brazil.

Australia, New Zealand, and the Philippines though important markets for American automobiles and machinery, made no purchases of any importance from a manufacturer's standpoint. The bulk of all such exports reported for the latter six years, most of which



The export credits included are certified by various countries and banks.

25 per cent of the total British exports to Canada in 1929, and, by 1939, it was increasingly significant part in this trend, accounting for 34 per cent of the British exports to 1929, 32 in 1929 and only 6 in 1939, when the Canadian industry with its factories and assembling plants of both British and American manufacturers of aircraft had gotten well under way. The United States, which in 1929 and 1939 bought 2 and 7 per cent of the total British exports, in 1939 purchased less than 1 per cent, exports to Latin America in 1939 amounted to 4 per cent of the total (justed of the 13 per cent which they accounted for in the

French exports in 1991 were larger than those of the United States for the first time in the century. For the first time the two superpowers traded more than the twelve smaller American states, with Japan and Germany leading the list. The U.S.S.R. and French possessions in Africa and the

Sweden was the most important customer of the German aeronautical export trade in 1931, with Yugoslavia second, and France, surprisingly enough, last in order, exceeding both Soviet Russia and Greece in both value and quantity of its purchases. Two very expensive experimental machines of very large size made up a great part of the German trade with France.

There is no way of making a classification of the exports of any country, with separate figures for civil and military craft. It is probable that for most countries a majority of the astronomical exports are military. Alliances and financial obligations play a large part in determining the direction of such orders. In the countries of the eastern hemisphere European nations, and especially France, have a marked political advantage in the military market.



Twenty shipment of plants and engines  
for Sweden deliveries

March, 1917

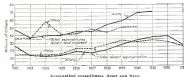


May 1998



### Military and naval

*American operations and world standards of air power*



wsp., Denmark, and Sweden give 2,600, 4,000, and 15,500 hours respectively.

As we have been anticipating in view of the growing importance of the arms aviation has been receiving a gradually increasing share of the total national defense budget. Aeronautical expenditures, direct and indirect, have climbed from less than 10 per cent of the total defense outlay just after the war to 17 per cent in the last year for which figures are available. (The 1949 figure read all the curve differs somewhat from that given on the table on page 134. The discrepancy is due to a difference in the definition of "direct expenditures" that in the table having been excluded the language of the standard and no reader. American totals and percentages directly comparable with those for other countries.) Direct expenditures alone rose from a post-war 4

	Army			
	1908	1911	1912	1913
Personnel	\$11,219*	\$10,368	\$29,328	\$27,100
	\$11,347*	\$10,545	\$13,054	\$14,100
	1,364	1,194		
	13,764	12,190		
	1,132	1,258	1,459	
	1,010	1,222		
	30	31		
	508	347		
	1,916	1,128		
	322,275	580,914		
	0,000	1,734		
	1,405	614		

### Military and naval aviation

	June				July			
	1956	1957	1958	1959	1956	1957	1958	1959
Accommodations—total, total per cent of civil accounts	\$37,547	\$40,383	\$29,538	\$37,912	\$22,513	\$33,833	\$35,118	\$31,258
Accommodations—rents, phone and employ	\$37,547	\$40,383	\$31,515	\$34,182	\$20,215	\$31,533	\$31,180	\$27,955
Total payment at end of fiscal year								
Office	1,364	1,386			5,609	5,704		
Estimated rents	13,761	13,170	14,559		12,219	10,875		11,111
Office payment at end of fiscal year	1,133	1,058			944	1,086		
Office public trial	0.00	1.213			476	802		
Ware					411	717		
Warehouse-Corps					85	85		
Estimated public trial	38	11			265	501		
Warehouse-Corps					194	208		
Warehouse-Corps					28	19		
Students graduated from flying schools during year	506	247			314	258		
Number of planes on hand	1,138	1,138			1,218	1,218		
Planes from fiscal year	321,273	306,914			364,709	355,406		
Number of planes	0.001	1.386						
Renters officers married and qualified as pilots	1,138	1,138			1,218	1,218		

## Procurement of aircraft, U. S. Army Air Corps

[illegible]

## Procurement of aircraft engines, U. S. Army Air Corps

[illegible]

For continuous unimodal values included in detail, but not listed separately

Both the Army and Navy continue to set up safety records of unparalleled excellence. During the past year, for the first time, both services averaged less than one fatal accident, for every 10,000 hours. Their combined average was 0.64 per 10,000 hours, or 15,625 hours per fatal accident. For the first time in six years, the Army had a better record over the Navy in the matter of safety.

On the other hand, as on flying hours, most air forces are very slow at giving out statistics. There probably is no great European or Atlantic Power that can claim a higher quality of flying equipment or flying personnel, or that conducts its air operations with greater efficiency, than Great Britain. During the war and until the Royal Air Force lost 43 fatal accidents, indicating, on the strength of the flying-hour statistic already made, a fatality rate of 1.3 per 100 flying hours. The French, Italian and American rates were respectively around 2.0, though the data at hand are not sufficient, or complete to justify separate estimates for those countries.

The air forces of the world

**I**T IS extremely difficult to make any comparative estimates of air power, but it is not quite so difficult as it was a year ago. In preparation for the Disarmament Conference at Geneva, all the great nations and most of the smaller have released an unprecedented amount of information on their military establishments, including aircraft. It is



Approximation for experienced mid-level managers



theory for new places and regions.

still true that in other countries governments compile figures as we published annually by the United States War and Navy Departments, but at least we have the material now for a general summary under certain headings—even though in some cases it must be more or less approximate.

Of course the Management Conference has not been the only source for this information. Some Eftosa countries furnished data directly on request. European scrambled peripherals have been drawn upon to advantage. A survey prepared by Howard Mingo and published by Carl Sporck Associates has been extremely helpful. Many gaps have been filled, and apparent discrepancies have been smoothed out, with the aid of ANASTAS's long-range correspondence and with data drawn from other confidential sources.

The finished cubic specks for itself it speaks, among other things, of some marked differences in organization and allocation of equipment among the major Powers. No other country, for example, bats so many airplanes of military types as being assigned to training and administrative functions as does the United States. No other country, on the other hand, has such a prepotentially small reserve of equipment. It is the general rule elsewhere for each squadron to keep with it, immediately available, an immediate reserve of about 30 to 35 per cent.

It seems to be the almost invariable rule, holding for all the leading Powers,



Relative's share of total war budget



France on land and sea purchase

## Procurement of aircraft, U. S. Navy

[illegible]

## Procurement of aircraft engines, U. S. Navy

[illegible]

<sup>a</sup>Statistical significance determined by the *t*-test ( $p < 0.05$ ).





### Foreign activities

## How do Europe and America compare?

**A** COMPARISON of accredited expenditures has been made in tabulated form, but it requires some little explanation. There are many gaps which could not be filled even after study of all the records available in this country. It is impossible to secure strictly comparable figures for similar

## Foreign subsidies and appropriations

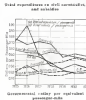
Country	TWh (millions of dollars)			
	Direct investment	Portfolio investment	Total investment	Total FDI
Barbados	0	4,368	2,298	6,365
Belize	0	0	0	0
Bolivia	242	220	0	228
Brazil	404	494	0	898
Canada	343	1,870	0	2,213
Chad	0	0	0	0
Chile	1	58	758	856
China	7,642	22	0	7,664
Colombia	444	4,298	0	4,742
Costa Rica	2,359	233	110,889	113,281
Cuba	0	0	0	0
Dominican Republic	2,220	819	0	3,039
Ecuador	1	0	824	825
El Salvador	2	23	1,875	1,900
Guatemala	2	23	1,875	1,900
Honduras	0	0	0	0
India	521	520	0	1,041
Jamaica	0	12,049	0	12,049
Mexico	1,000	1,112	0	2,112
Nicaragua	0	19	2,118	2,137
Panama	0	11	1,354	1,365
Paraguay	0	0	0	0
P.R. (U.S. Islands)	234	228	0	462
Peru	0	0	0	0
Trinidad	0	229	54,465	54,694
Turkey	0	0	0	0
Uruguay	0	82	2,413	2,495
Venezuela	0	0	0	0

Order 88 747 000 paid out on air mail contracts. Air mail revenues sales.com.

In 1946, all successful operations given credit, with amounts equal to Division and Colonel governments included. Military appropriations and total are given, including unpaid amounts from the Indian government, since the Indian Air Force is essentially a part of the Royal Air Force.

† These figures are based on an assumed production factor value of 11 cents per cubic ft of the well by taking 60% of the normal value of 50 cents, which is required by a local ordinance. Therefore, the total production would be \$1.10 per cubic ft.

The world's water & Indian military forces have been transferred to Great Britain. The Indian expenditure on all matters goes towards the improvement and maintenance of ground facilities for Imperial Airways. (London, 1940)



having any military air force, and which must, therefore, charge all their aeronautical expenditures to the civil division. In Germany a large amount of miscellaneous research, development, and administrative work that would be carried on in any other country by the Army or Navy has to go down as civil expenditure.

The highest per capita expenditures for civil aviation is undoubtedly that of Canada. Taking into account the probable deficit on the air mail contracts, the total governmental outlay there amounts to 45 cents a year for every resident in the Dominion. The equivalent figure for the United States, including the air mail deficit is 28 cents. Belgium spends 30 cents per capita, largely on airway development in the African colonies, while in other European states costs are high as 25

The spending on total per capita expenditures, including the military, is quite different. On that basis, both Canada and the United States, each with a figure of just over \$1, are well down the list—far below France with \$3.45, or Great Britain with \$3.73.

To show what the several countries are getting for their money in the way of air transport operations, the curves at the bottom of the page have been

With the direct subsidies to the transport companies and the total expenditures on civil aeronautics have been plotted. The figures need not necessarily correspond to those in the table, since the latter include the expenditures of non-aeronautical departments, and particularly those for meteorological service along airports, have been counted in. In the case of the United States the figure plotted as the total government outlay on civil aviation includes the appropriations of the Department of Commerce, the Post Office Department's deficit on air mail, and the Weather

It appears that the American government spends on the provision of civil flying about a third more than France, Germany, and Great Britain together. The American government, however, gets more for its money than do those of most European countries. The air plane mileage flown in air transport under the American flag was more than three and a half times the combined

Passenger traffic in  
passenger-miles

	1928	1929	1930	1931
<b>North and South America</b>				
Canada	422	470	565	55
U. S. Mexico	1,588	1,359		
				2,225
<b>Europe</b>				
England		657		
Continental	733	1,420		
Germany		26.5		
France	1,149	2,700	4,870	11
Germany	13,818	14,975	14,361	15,265
<b>East Asiatic</b>				
China	4,576	7,127	4,711	4,891
Japan	3,823	5,595	8,150	8,995
Philippines	4,123	4,252	4,400	2,500
Poland	1,947	3,548	2,438	3,161
Russia				0.00
Spain	2,070	725		1,741
Sweden		779		
Unclassified		791	669	1,350

Annual airplane mileage  
in air transport[illegible]

6 cents, the contribution of the government is five times that of the patron. In the past it has been conventional to reduce these subsidies to dollars payable down for purposes of temperance, but transport airplanes vary widely in size, and that course was unwise to the large machine.

The French and German contributions to civil aviation have varied relatively little over the past three or four years, although the German figures

[illegible]

show a gradual downward trend. Both counts in the neighbourhood of 50 occur per equivalent passenger-mile total for the north direct and 40 counts in the westward and 20 counts in Germany. As previously noted, the civil aviation budget in Germany has to carry an exceptional amount of general aeronautical expenditure. If Germany had a military air force, it is probable that they could get the same results that they are getting now with their civil aviation and with the same general methods of operation with a total civil aeronautical expenditure of 20 counts in the north, per passenger-mile.

The case for Great Britain and the United States have shown a more definite tendency towards self-support, at least until the war year. The Jewish state has to strive to a deadline at about 30 cents per passenger-mile, and is to enable to reduce their governmental expenditures below that point. Our own figure had fallen off usually to 15 cents per equivalent passenger-mile for all governmental contributions, including the air mail deficit, in 1930. In 1931 it amounted to 20 cents. The depression, and the consequent slowing down of the rate of income of commercial traffic, is largely responsible for these

In proportion to the actual amount of transport operation the government of the United States is spending just about one-third less than the most liberal of the three European nations looking at transport tying, and less than half as much as either of the others.

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expenditures have been calculated for the last two years. For Italy the 1992 result is slightly 46 cents per equivalent passenger-mile, a little above the Danish figure. The Netherlands, with a small area and comparatively little railway construction to be done, its government expense except in the Dutch East Indies, have made the best showing of all—8 cents spent on civil aviation for every passenger-mile in 1991 and 7 cents in the previous year. The operations of the K.L.M. have of course long been famous for economy.

## Value of traffic

UNITED STATES of the United States Department of Commerce, Bureau of Economic Analysis, in its general volume of air transportation operations and traffic there only a relatively slight decrease. The object of this report is to show the effect of the widespread cold progressively noted during the winter months on the air transportation of passengers and mail. It would have covered their incidence on a satisfactory basis. Most of them have been in the form of weather delays as they are slowing down, but further development would not be because of the need for recovery. Only in Russia has there been a marked increase in the number of flights out of the United States in the last two years. Italy has also gone ahead comparatively heavily, while France, Germany, as judged in the figures, have virtually stood still. France and Germany show an actual decrease in mileage, but this is due to the fact that only two countries have registered an increase of less than 10 per cent in two years—two years in which the American record was 100 per cent. The United States. The value of the services has been much increased by extension into new territory and the rise in the price of the services. In the United States, the increase in the price of the services has been much increased by extension into new territory and the rise in the price of the services.

Express and mail traffic  
in ton-miles

	1950	1955	1960	1964
<b>North and South America</b>				
Canada	14	58	215	190
Colombia	45	144		
Mexico	28	288		288
<b>Europe</b>				
Belgium		95		
Denmark	16	95		
France	450	574	973	116
Germany	150	425	145	145
Greece	215	345	520	400
Italy	80	49	185	196
Netherlands	150	211	304	325
Poland	40	45	67	51
Spain	15			28
Sweden		6	100	11
Switzerland	23	139		140
<b>Rest of World</b>				
Israel	3			

World (estimated)	** 2 566	1 830	5 326	1 888
United States	1 040	1 498	5 158	1 261

\*Approximated from partial returns. Excludes  
 some and foreign born \*\*Including United States  
 and Canada

### Accidents

	Passenger loadings per million passengers-mile								Average 1960-66 level passenger
	1924	1950	1964	1950	1929	1934	1950	1961	
Texas	0.96	1.05	2.94	1.25	0.67	1.29	1.25	1.44	0.67
California			0.44	0.54	0.11	0.49	0.59	0.66	0.40
Great Britain	2.67	0.88	0.95	0.88	0.40	0.40	0.40	0.40	0.40
Italy					0.40	0.57	0.36	0.55	
Switzerland	2.16	2.14	0.55	0.88	0.05	0.18	0.38	0.38	0.14*
United States				0.70	0.04	0.20	0.18	0.21	0.25

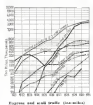
\*This award is based on being average up to \$1,000,000 per year. (All other averages based on a 100% of the total.)

The growth of the relative importance of express and mail traffic on the European lines is quite considerable. America has the reputation of being the base of the air mail, while passenger transport by air was first developed there. Nevertheless, in the last time mail and express make up only 23 per cent of the traffic on the American airlines, the passengers the remaining 77 per cent. In Great Britain the corresponding figure for mail and express is now 37 per cent, an increase of 14 per cent since 1938. In the Netherlands it stands substantially at the same level, while in France it is 42 per cent. Economically, mail and express are more important to American air transport than anywhere else in the world, but in volume of traffic they are far surpassed by the passenger traffic. European countries

The more conclusive develops from a comparison of the traffic statistics for the United States with those for the rest of the world. Roughly speaking, this country had 50 per cent more transport mileage than in 1931 than all the rest of the world together, and 65 per cent more passenger traffic. Putting it in other terms, 60 per cent of the world's passenger transport was in the United States. Of the total road and express transport traffic, however, this country handled only 47 per cent.

### Commercial lead factory

It is hardly possible to get statistics on the proportion of available passenger cargo space occupied on transport lines in comparable form for any considerable number of countries. In the



United States on such figures are complicated, and in European countries they are figured on various bases—some including passengers carried free of charge, while others eliminate them from the count. Taking all that into account, the average cost of a round-trip shows a rather remarkably small range for Great Britain, Germany, Italy, and some of the smaller countries. The British averages run somewhat higher than those for the continental countries, but are still well below the \$35 to \$40 per seat. Although the corresponding American figure can only be very roughly approximated, it seems probable that it lies in the neighborhood of 50 per cent for the American lines and 60 per cent for the European ones.

### *Passenger safety records*

Contrary to another assumption which American tourists still seem occasionally to adopt, that it is safer to fly in Europe than in the United States, American accident figures show a notable and growing openness over those for practically all European countries. On the basis of the average passenger accident figures for the last five years American transport flying has been 60 per cent safer than British, 93 per cent safer than Germany, and 200 per cent safer than Finnish. Italian lines have gone through five of the last seven years without accidents, but a very bad year is 1926 brought

The best record of all, however, although on a comparatively limited volume of operation, is that of the Netherlands. The fatality rate on Dutch airlines over the last six years has been less than half that on Australian lines over the last five, less than a third that of any other large European country. It is an extraordinary performance, especially in view of the proximity to the line from Holland to the Dutch East Indies.

Although the accident rate obviously is not unconnected with the efficiency of the operations, it cannot be taken as a direct and exclusive measure of their quality. In some cases where there is a large amount of flying over sea or over desert or over jungle the opportunities for fatal crash are exceptionally great. French airlines, for example, probably work on the average under conditions more difficult than those of most other European companies.

## World plane scenarios

WE NATURALLY look first at the habits of airports, airplanes, and highway pilots in the various countries of the world to see how the figures for other lands compare with those for the United States. There is nothing so obvious as the comparison. The United States is the world's largest and best equipped airport, and it has learned all competitors with the rest of the world in air-terminal development as it in the manufacture and use of highway motor vehicles, but we are still well ahead. The United States has almost four times as many airports as the rest of the world combined, and the number of the world outside of Canada. For example, the ratio is one and a half to one. For qualified civil pilots the ratio is even higher, more than 70 per cent of the world's licensed pilots being in the United States. Correspondingly, the proportion is still the same for air pilots. North America again has more than twice as many pilots as the rest of the world.

Turning to the comparison of individual countries, it is surprising to find that the largest number of civil planes

located in France, for the French people have not had the reputation of being great costs of aircraft of private ownership. An explanation is found in the lavish component of French transport lines, and especially those operating in the French overseas territories. The French transport companies, in number, by nearly two to one, the total for all the silver transport lines of Europe, and they outnumber by just a third the transport planes in the United States, where there is approximately six times as much operation as in France.

Germany is second in order, Germany has 1,044 transport aircraft, Italy has 700, and the United Kingdom has 600. The number of planes, on per capita ownership, France still leads, with Great Britain second and Germany third among European countries, but none of these reach the standard of the United States, Canada, or Australia. Per capita ownership in the United States is just about the same as in Great Britain, but at the times as high as 100 per cent.

The pilot figures by individual countries present little of novelty. Taking the world as a whole, it is common rule that the pilots exceed the civil classes in number by 80 to 100

## World distribution of airports, airlines and licensed pilots

	Months			Revenue net of costs		Thru-out Total		Thru-out Total		Fiscal year Actual		Fiscal year Actual		Fiscal year Actual		Fiscal year Actual	
	Oct	Nov	Dec														
<b>North America</b>																	
Canada	78				47,600	90	30	30	30	20,200	118	21					
<b>Central and South America</b>																	
Bolivia	48	2	2		47,500	8	0	1	1	1,600,000	11						
Brazil	48	19	19		29,100	0	0	0	0	200,000	11						
Chile	17	19	3		1,000,000	30	11	11	11	1,000,000	11						
Colombia	0	5	0		51,000	31	10	2	2	200,000	11						
Costa Rica	3		1		1,000,000	21	20	20	20	200,000	11						
Cuba	10	10	2		1,000	0	0	0	0	200,000	11						
Guatemala	19	17	17		2,000	0	0	0	0	1,000,000	11						
Honduras	19	17	17		2,000	0	0	0	0	1,000,000	11						
Paraguay	3	10	4		1,000,000	24	22	22	22	200,000	11						
Puerto Rico	3	7	1		1,000	0	0	0	0	200,000	11						
<b>Europe</b>																	
Belgium	0		0		62,100	10	40	40	40	200,000	11						
France	18	18	18		1,000	111	0	0	0	1,000,000	11						
Germany	3	3	3		2,000	111	0	0	0	200,000	11						
Italy	14	14	14		1,000	102	151	151	151	200,000	11						
Netherlands	14	14	14		1,000	102	151	151	151	200,000	11						
Sweden	14	14	14		1,000	102	151	151	151	200,000	11						
Switzerland	14	14	14		1,000	102	151	151	151	200,000	11						
U.S.S.R.	14	14	14		1,000	102	151	151	151	200,000	11						
Yugoslavia	14	14	14		1,000	102	151	151	151	200,000	11						
<b>Asia</b>																	
South Africa Union	2	2	2		1,000,000	40	6	6	6	200,000	11						
<b>Australia</b>																	
China	2	2	2		1,000,000	40	6	6	6	200,000	11						
India	2	2	2		1,000,000	40	6	6	6	200,000	11						
Japan	2	2	2		1,000,000	40	6	6	6	200,000	11						
<b>Oceania</b>																	
British East Indies	2	2	2		1,000,000	40	6	6	6	200,000	11						
British West Indies	2	2	2		1,000,000	40	6	6	6	200,000	11						

[illegible]

per cent, the apparent surplus of pivots in the United States being only a little above the average for the rest of the world. No German statistics can be obtained, but suffice from that the principal European countries rank in the same order as in slave-breeding.

### Aircraft production

**FIGURES** on civil aircraft production have almost always been very hard to get, but we have been better off, by pooling the results of our own efforts with the figures obtained by the Department of Commerce from the governments of the aircraft-producing countries, to get somewhat more complete and accurate data than ever before. Outside of the United States Great Britain appears to have the largest civil aircraft production, accounted for in two or three factories. France, Germany, and Italy are fairly close together. There are no official figures on Russian production, but it is estimated to be between 200 and 400 civil machines a year, most of them at or at least five-pennings capacity. The United States had about 47 per cent of the total production in 1935, and in the first year since 1925 that she shared her fallen below a half. For this table, the Chamber of Commerce reports on machines built in established American plants, and does not count American companies working in Italy.

### World airport facilities

A CRUCIAL degree of discrimination must be used in preparing airport figures, as a field which would be given the very highest rating is a small part of the total area. The runway part of the world might be given the highest rating in Germany or Great Britain, whereas any such a Germany, however, is taking the form of a small area. The rating is officially reported. Caste makes the best showing on the distribution of the Great Britain seems not, as usual, to be the best. The number of cities and of the coastline for private flying that costs them. No country equals the record of the United States. It would perhaps be fair to compare Great Britain with the northeastern United States alone, and that with the United States. On the other hand, airport needs are better provided for than those of the British, for as New England and the Middle Atlantic States are in the average, airports are added for every 500 acres or against one for every 1,200 acres in rural areas.

If recognized and listed auxiliary fields and military fields be taken into account, however, most European countries would outrank the United States on airport density. On that basis, Great Britain would average about one field for every 480 sq mi of land area.



completed in January, 1933, has been commercial. A number of inquiries have been received, including one from Howard Hughes, aviation pioneer in person. The Goodyear-Zeppelin Corporation is considering making an offer. It has been reported that proceeds from the sale be devoted to the additional expense of enlarging the new airship to a capacity of 7,500,000 cu ft—a proposal which Admiral Moffett favors. ZEP-5 would then be larger than the new Go-mas 1,210, which is to have a capacity of 7,236,000 cu ft.

With its assets well being depleted, the Akron, weathered amazingly a recent tilt with the elements in the course of a previous tactical exercise with surface ships of the scouting force. While passing down the east coast to engage in the first exercise off Florida, the airship encountered low fog, sheet rain, and gusts, which gave it a violent roll. During the first eight or 10 minutes on some parts of the fin to the depth of 6 in., and a cut in one forward on one of the hull. No difficulty was apparent. Several modified features of the top one to the successful meeting to the airship's salute. Thanks to the Veterans Corps. The next step in preparation for the maneuvers in the Pacific was the installation of four special Canine Engines at the airship's hull heights. These engines will tend to landing gear when operating with the airship, and performance should be considerably high in spite of turbulent air and weather.

Now scripted as a trial and test case, the Akron is about to have a new commanding officer. The vessel will be replaced by the new ship, Charles E. Henscheid, successor of the Sta-

ndards director and for one point the Navy's fastest ship, to be sent to sea on a surface vessel. Comdr. S. H. Denny, now in command of the Los Angeles, will succeed him.

The introduction of airship into civil air transport on trans-oceanic passenger and mail lines would become possible under bills introduced into the House and Senate by Representative Robert Cramer and Senator McNary. The Parker-McNary measure introduced last Friday, both provide for mail contracts on fairly liberal terms and for construction funds at low interest rates, like those by which the federal government supports the construction of new merchant vessels.

### Air space ownership restricted

The national boundary following, in accordance with reference to legal and legislative matters elsewhere in the same point, is based largely upon the Airline Law. As to the ownership of the air space, the Airline Law, however, is limited to make use of the service and is not to be made the basis of the work of an organization specially trained and equipped to conduct the service of air mail service under law in various legal developments.

The right of a landowner to the air space above his property has again been opened to a re-hearing of the famous case of *Swothart v. Curtis Airways Corporation*. Owners of property adjacent to the airport which the Curtis company had been developing near Richmond Heights, Ohio, had asked for an injunction against the airport because of the continuous low flying over their houses and the fact that the field. The lower court granted it.

Some 10 years of debate by the International Commission for Air Navigation have finally resulted in the formulation of regulations governing standard design and the manner of construction of air-ventures. Some of the regulations in many details, they are to be put into effect in the 26 countries parties to the convention of 1929. The regulations generally resemble French practice.

Consistent with announcement of the expansion of work on the largest aircraft flying today are details of the proposed D-100 giant designed for use on the American-Bureau route. Almost twice the size of the D-5, it will be a monoplane of light metal and non-powder steel, with the engines and most of the passenger quarters installed in the wing. Ten 1,000 hp engines will be installed in the wings, and will be used in a speed of about 140 m.p.h. and with a normal passenger load of 400 persons and two tons of freight, range of 7,200 mi. It is, as yet, a paper airplane. Y. K. Koyama, Japanese designer since 1912, makes the project.

The engine of the airship R-101 were the acquisition of several years' research on "atom-cooling." Final experiments of several months' duration with dry

United States Circuit Court of Appeals confirms the restriction, but narrows the grounds on which it had originally been issued. The court states that low flying is a single instance constituted a trespass, but allows that repeated passage might constitute an abatement nuisance. Whether or not it did would depend on the particular circumstances. Denying the absolute ownership of air space, the decision is very encouraging to aeronautical interests.

The final draft of a national aviation code for adoption by the states, under consideration for some time by the Associated Law Committee of the American Bar Association (previously discussed in *Aviation*, October, 1931, p. 567), was drawn up at a meeting of the committee in St. Louis recently. The code, which defines the ownership of air space above privately-owned property as well as liability of aircraft for damages to passengers, baggage, and freight, will be submitted to the association at its annual meeting in Washington this fall. Upon completion of the code, the association will take legal action to persuade states to amend their statutes in conformity with the proposed code.

### International Bulletin T-A

Legal standardization on an international scale will be among the deliberations of the Seventh Pan American Conference in Montevideo, Uruguay, in December of this year. The Committee on Commercial Aviation, agreed at the Sixth International Conference of American States in 1928 and is further ratified by five countries, including the United States, will have the basis for the study.

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### TWO NEW GIROS

In England have appeared the new motor and spin engine, with speed with the three-bladed rotor system which flights back on a shock.

will make bombing planes and a multi-engine transport are expected to possess the efficiency of an evaporative cooling system which can only effect a saving of 100 lbs. at most to 100 lbs. in a 500 hp engine, but also reduces dangers of engine temperature variations. Water circulating between the cylinder jackets and a pressure tank across steam. The steam rises to the condenser, is re-circulated to a liquid state, and begins the cycle anew.

### Faster fighters, faster bombers

A possible addition to British line-up of high speed fighters is the Vickers-Johnson, a seven-seater fighter under development at Brooklands aerodrome. A two-seater of 235 m.p.h. is available to it at the high altitude where its super-charged 530 hp Bristol Mercury engine operates at its full power.

Greater speed, efficiency and combat will be insured Army Air Corps pilots by recent acquisitions of the Mitchell Division. The new V-62 single-engine pursuit biplane powered by a Gifford V-1504-C 620 hp. engine has a speed of about 300 m.p.h. at sea level and climbs at 3,400 ft. per min. toward the higher altitudes where the newly-tested Gifford biplane has given excellent results. A newly perfected 40-hp. radio, capable of transmitting and receiving aerial voice or code on about

one-thousandth the power used by a cutting wave, can keep the pilot in constant touch with the ground and with other planes at a distance of 75 miles. Developed under the direction of Capt. H. M. McCallister, army radio expert, and tested by the Navy-8th Pursuit Squadron at March Field, Cal., the new set fits in a space of less than a cubic foot behind the cockpit and has a 12-ft. aerial string from wingtip to tail.

After an month's earlier special guard at the Marine plane in Baltimore, a new bombing plane carrying a crew of three men has been delivered to the Army Air Corps for testing. Two Bristol engines, developing about 1,200 hp., back into the wings of the plane and a retractable landing gear put it among the fastest bombers in the world, with a speed of more than 180 m.p.h. The Boeing monomotor bomber delivered to the Army last summer, also investigated has a speed of the same order.

### Air races emancipate women

National Air Race associations already announced for the coming fall include an expanded use of biplanes in closed-course events and the introduction of a 3-mile oval course with one straightaway directly in front of the grandstand and the whole circuit in full view of the spectators. The high-speed event, such as the Thompson Trophy and Auld

Trophy races, will be flown over a 16-mile triangular course at Lancaster. There will be more stress on fast-but-all events than in the past, less emphasis laid to more for A.C.T.-holding machines.

Another important novelty will be the abolition of the dressmaker, flightmakers the women pilots have been restricted to raven tail woman only. This year, they may make everything. As in 1931, a series of races between the winged and the winged will be held under Chief Hindman's direction to correct tentative rules and programs.

Changes are to be made in the year's first day races in England. It is to be run on two days, the first day's event a trial test to qualify a maximum of 50 machines. With the removal of the women's racing in 1932, the year's first airship contest of a speed of 115 m.p.h. or more and any pilot with at least 300 solo hours will be eligible. The event for the first day will be 720 miles, that for the final day 500 miles.

Charles Quackenbush recently added into the back to his cockpit with his Packard-diesel-powered Lockheed, and made effective answer to critics of the desert who have alleged that the type would not run at all in high altitudes, since the heat of compression of low atmospheric pressure would be insufficient to fire the charge in the cylinder. Quackenbush's method on altitude slightly in excess of 70,000 ft., probably a record for a compression-ignition engine plane. So far from being a failure, the engine has run, the reports of the night stated that the engine had to be closed slightly at the high altitude to hold a constant speed. The engine was a 100-hp. engine. During a recent inter-continental survey trip for the Texas Company, Frank Hawks squandered a record flight between Los Angeles and Vancouver in the last time of 13 hours and 44 minutes (2,250 miles, 164 m.p.h.). He used his old-fashioned Travel Air 3. Though he was a record for the round trip, Hawks failed by 6 minutes to break the one-way record to Vancouver held by James E. Wood.

### Pilot on A.I.P.A. in

The first strike, or incident, or combination of both, on a United States airline has occurred. Pilots and executives of Century Airlines, an airline, have a new management and the former, members of the Air Line Pilots' Association, on Feb. 9 issued their own pilots' union. The pilots' union was established and a new pilot force might be collected. Unusual significance was attached to the episode because it is the first occasion in which the pilots have organized. The company had sought to change pilot salaries from a fixed to an hourly rate. The company officials said the change was necessary to a 15 per cent wage reduction over a period of a



### COMMEMORATING A FAMOUS FLIGHT

This monument to the trans-Atlantic flight of a number of British aviators was dedicated early in January at Baltimore, Md., on the first anniversary of the taking from that point.

year. The pilots and it would be 30 per cent. The Air Line Pilots' Association has refused, except its volunteer members, with all the preparations traditionally associated with labor unions at sea. All members who have no unions are to be accepted, that article being the only one to be paid. Any pilot taking employment from Century while the old pilots remain inactive is to be blacklisted by the Association. Century's operation are to be pushed, both on the ground and in the air. The struggle will, unless a compromise is very promptly reached, go far to determine the future of the Pilots' Association, whether it is to be a completely weak body with interests largely social or an extremely powerful and aggressive factor in determining the operating and financial policies of the air transport firms.

**Landing.** Less than another six in the air transport field by assuming permission to stop at its hourly services between New York and Washington to a half-hour frequency in April. Twenty round trips daily in the plane form are flown at the present time. The trips are to be made with a stop, flights between the two terminals, the former 80 minutes, Consolidated proposes the reduction. Thus, Landing is added to the list of airlines no longer receiving multiple engine rental for passenger service.

Effective Jan. 15, the company set new low rates for the New York-Washington service. Formerly \$112.25, the through fare now is \$110; the round trip \$115 instead of \$20. The fare is down to \$20 a week. A ticket, to attract passengers during the winter months. Eastern Air Transport, Ltd., London's competitor, has announced a corresponding change, but maintains the \$125 one-way rate.

Meanwhile, last summer the same of the first railroad agency in the now considering a bill authorizing roadways generally to operate both motor vehicles and airplanes.

Early legislation of several railroads to the routes by the Illinois Commerce Commission of certificates of convenience and authority to direct air transport operations whose schedules to some extent coincide with the railroads was later reversed. The commission decided that more types of air transportation offered by the airlines was not considered by the railroad there was no appreciable conflict.

#### All-Red Cape-Cairo complete

Chief among new services (reopened) is the Cairo-Cape Air Transport, Ltd. The first through flight, started from Cape to Cairo Jan. 28. The new part of the Empire system consists of the operations between Cairo and Cape Town, the Cairo-Nairobi section having been opened on Feb. 28, 1931. The flight from London to Cape Town, at present.

#### AVIATION March 1932



**WASPS IN EUROPE**

The new Airbus of rapid transport in use on A.T. W. weekly Aeroline. British passenger and mail service are listed with Post & Wireless engine.

over 8,000 miles, connects twice daily. All planes are in use at least 10,000-hr. payload capacity) and multi-engine. Aeroline's Sunday Airplane are used between Cairo and Khartoum, Short-Course flying boats between that point and Nairobi, to Elkhart, the line between Nairobi and the Cape.

Imperial Airways has taken delivery of the eighth and last of its fleet of Handley Page four-engine light transports at the Harlow plant. Four are in service between London and Paris and the balance are operated between Cairo and the Near East, following the Hercules machines for the African service. The continental Hercules are fixed to accommodate 30 passengers, the others but equipped, to provide greater comfort in the warmer climate.

#### New Pan American service

New persons include the 36-hour air-mail service between New York and points served by Pan American Airways at new low combination rates (to New York, New York, and 200-mile extension by United from Omaha to Watrous, S. D.).

T. A. C. has moved its operations headquarters from Portland and its mail-purchasing department from Cleveland, to the latter at the Denver City Airport. The company will assume the freight from Lake Erie service between Detroit and Cleveland April 11. It has followed up its experimental air-mail-containers airway with the same by negotiations with foreign governments for leases on suitable landing points along the route.

Imperial Airways has shifted its Miami terminal from the Pan American airport on 36th St., Miami, to the Miami Municipal Airport. Robertson Aircraft's service between St. Louis and New

Orleans has been discontinued. Century's service has at Minneapolis added links between mid-Western cities within six months.

United Airlines and Western Air Express have opened up their scheduled Los Angeles New York passenger service by two hours, making possible an all-day and night trip between the two cities in 26 hours and 40 minutes. The night section of the flight is between Salt Lake City and Los Angeles.

#### Eastern Condors hubbed

Further contribution to passenger comfort is to be made on planes of the Eastern Air Transport line by the introduction of a smaller for request to reduce noise by 70 per cent. (under no circumstances is stated). A single exhaust manifold two and a half times the diameter of the old type continues to give the exhaust gases a whirling motion, so using up energy before release into the air. Designed and developed under the direction of Chief Engineer Robert G. Lewis (father of recent maintenance strikes in AVIATION), it has been in use for three months in several of the company's Condors, and will soon be standard equipment.

Harry Spent Lines is reported attracting heavy traffic on the Los Angeles-San Francisco run and forcing a general stepping up of scheduled service to 10 times, 50 minutes service with Lockheed Condors. The Pacific Air Transport schedule was recently advanced from 3 hours to 3 hours, 40 minutes, down to 2 hours, 30 minutes.

All-engine air line, using propellers, is being developed by the advantage of air transport on wooded tracts and inland valleys. Possibly far-reaching negotiations

#### AVIATION March 1932

were held in January between French and German representatives regarding consideration of interests in developing Europe-South America service.

All employees of United Air Transport are included in a group life insurance plan recently taken up by the company. Each pilot is insured for \$5,000, with rates for \$1,000.

Express continues to receive extra attention. T.W.A. has arranged for the all-hub service started in October in cooperation with the Canadian lines to include packages as well as passengers. Packages now are received at all Greyhound stations and forwarded through associated subsidiaries by air and land. Century in January began flying an express contract with the Chicago West Order Company for transportation of packages daily to Cincinnati for delivery.

The service will be expanded to include other key mail-distributing points. A promotion and advertising campaign is to be started soon by the Robert Greyhound Agency and the line with which it has contracts to increase patronage of its system under the new rates announced next month.

Paul Goddard announces that the work of "radioing" the airways for the transport companies, undertaken about two years ago by Aeromarine Radio, Inc., is about 90 per cent complete. Equipment has been installed in about 80 cities, and a considerable of the radioing type.

Century-Pacific had its first major accident on Jan. 29 when a tri-engine Stearman crashed on a grassy field in the Tebechips, about 30 miles south of Berkeley, not long after it had taken off from that point. Weather conditions were extremely poor, and it appeared the mechanic had struck the ground while the pilot was attempting to go back to the field.

Century-Pacific service, already suspended from Tucson to El Paso, is reported likely to go through to St. Louis soon. The Arizona Railroad company has postponed leaving the line's application for new certificates of convenience and necessity until March.

#### Lawnmowers think about passengers

The Century made revised agitation for compulsory installation of parachutes in passenger transports, though there is little in the circumstances of that remedy to suggest that parachutes could or would have been used. Some excitement has been created by the appearance of an article in *Aviation* by a parachute critic, pointing out the alleged profits of air transport in bird terms. A parachute-exacting bill was introduced in the New York State Legislature in January. Early in February a bill was introduced in Congress by Congressman Coffer of New York to require parachutes on all passengers in all interstate transport flying.

The first bill is to be introduced in the present session of Congress regarding air mail would be \$1 per mile based on \$125 as the maximum compensation for again, and would limit the route on which it is to be used to the route. It was introduced by Representative Brainerd of New York and was referred to the Post Office Committee. It would have no practical significance, as no contractor gets over \$1 a mile now.

As a result of a resolution introduced into the Senate early December, recently agreed to, the Committee on Post Office and Post Roads will investigate air mail contracts and methods of transporting mail from airports to post offices. A further resolution is created the Postmaster General to provide the necessary detailed information about individual contracts. The Senate is also investigating, at the behest of Mackle of Tennessee.

East St. Louis and the Central-Siberia flying service have been negotiating for the designation of that field as the St. Louis air mail terminal instead of Lambert. The first of the Central-Siberia flying service have been scheduled with Postmaster General Brown; indication was that a change at the present time is unlikely.

T.W.A. reports that mail traffic over its line has increased six-fold since the Post Office Department ordered rescheduling of mail between Los Angeles and New York in January. About \$25,000 is being spent equipping away at its fleet of Fords with wing mail bins. The first of the new mail bins was opened Jan. 25 between Miami and Miami by Philippine Air Taxi.

#### Airway over the Berkshires

A carrier is to be undertaken soon on the temporary airway between New York and Albany by way of Springfield, Mass. American Airways received the mail contract for the route under the extension granted last summer, but will not begin operation until March.

Lawnmowers think about passengers



The Italian mail plane, the first of the type built by Fiat, is shown in flight. It is the first of the type built by Fiat, is shown in flight. It is the first of the type built by Fiat, is shown in flight.

ing it until the success and immediate flight have been secured. The revised edition of Aeronautics Bulletin No. 11, which carries regulations regarding interstate flights, reveals that the restrictions have been lifted to include all properly supervised operations considered for the public good.

Following growing interest in favor of state development of intra-state airways, Michigan has taken over the business generally assumed and operated by Transcontinental Airlines, and the Illinois State Aeronautics Commission has prepared elaborate plans for a state airway system which today becomes available.

Along with the interest in developing state airways to develop the idea of state licensing of airports. Recently the Illinois State Aeronautics Commission announced that after Feb. 25, 1932, airports within the state could not be operated without a license from the state. The first annual report of the New Jersey State Aeronautics Commission indicates the recommendation that New Jersey pilots be licensed. That state includes two of the heaviest civil flights in the East, Central Airport at Camden and Newark Municipal Airport. The latter experienced a tremendous growth in traffic last year, passengers cleared amounting in 1931 to 50,000, as against 22,500 the year before.

Representative LaGuardia of New York, aviation enthusiast, has asked the House to provide a public terminal airport at Governor's Island, New York, under Air Corps post, and has introduced a bill authorizing appropriations to increase the present flying field area at the island for that purpose.

The superior ballooning and 81 at the site of the new Belmont Municipal Airport may be an unsatisfactory one, but it is not a new one, and an engineer's report indicated the work to date had been wisely wrong. A newly completed report indicates that the end of the city will fly out with the passage

#### ITALY'S D.O.X.

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of time. Kansas City has appropriated \$38,140 in airport bond funds for a \$100,000 project to reconstruct a 3,000-space Municipal Airport has received the A.T.A. ruling. Miami has bought a 1,750-acre strip which will contain the municipal airport, the Naval Reserve field and a tract designated for light-tower use by the Navy.

Reynolds Field reports a net profit of \$125,451 after expenses and depreciation in 1951, as compared with a net loss of \$157,741 in 1950. Expenses at Oakland Municipal Airport have been lowered. The former monthly rate of \$60 for six plane machines has been cut to \$30, the \$40 rate for four-plane planes to \$25.

There have been two bad happenings recently. Continental Airways lost two planes and three planes at the Chicago Municipal Airport, the damage amounting to \$175,000. Three planes were destroyed by fire in the hangar on the private DeWitt field in Wilmington.

Thompson Aircraft Corporation reports a net profit of \$194,925. Receipts from transportation and other operations total \$922,663.87; net operating revenue total \$12,999.00; net expenses total \$194,708.26.

Continental Motors Corporation, claiming a strong overall position, reports a net loss of \$34,567.87 in the Commercial Aircraft Engine Company subsidiary. Ugo V. D'Alessandro and J. V. D. Garrison of New York City have been appointed receivers for the American Aircraft Corporation. The company has liabilities, exclusive of capital stock of \$225,000, and assets of \$210,000, most of them frozen at the time of the First World War plant.

## Currie-Wright goes east of seas

Currie-Wright has arranged with the Turkish government to undertake airport and airway surveys and the reconstruction of airports in Turkey. William H. Robertson and F. E. Hahn have been chosen to handle airport and airway surveys. Capt. S. C. Cline will supervise the airway surveys and a plane factory built three years ago at Rayhan, Turkey, but never used.

Stinson has supplied its regular factory (announced in January) with a new set of four-plate piston machines. Organization of Newark Airport Corporation by the Douglas Aircraft Company is reported. It is understood that J. K. Nussling, formerly engaged in developing machines for use on the new United States airport, is active in the new Douglas subsidiary. Following the merger of Airco Products Corporation and Warner Aircraft, announced in the February issue, the former company is now designated as Ponderb, Inc.

Despite economic difficulties and gen-

eral economic conditions, the aircraft industries of Europe continue active. Both France and Great Britain report record export orders for 1951 with an excess of those of the United States. The Jenkins company, of Denver has received a contract of orders from various foreign countries and has increased the working staff from 300 to 4,000 and the working week from 40 to 48 hours.

A two-place Fairchild model 80C plane, powered with a Lycoming Currit, has been redesigned and will deliver 100 mph. It is now being run, also, on a Mexico Private Installation in a Fairchild 22.

## Giroe go wandering, find new builder

Latin America's first contacts with the aviation have come about through Louis A. Vassie's recent flights to Cuba and Mexico. On Feb. 4, he made a landing at the site of the Mayan ruins of Chichula-Hu, in Yucatan. On Feb. 7, he landed successfully on the beach at the site of Mexico City about 3,000 ft above sea level, and later took off there.

Following an accident to one of the Mayan ruins at Quetz, Vassie, an official news release was issued stating the accident had been caused by the carrying away of an outer blade. If true, it would have been the first time such a failure had occurred since first had become commercially available. Following an Air Corps investigation, the Navy's official report stated another reason, declaring that the statements in the first were in error and that an investigation had been launched to determine whether the accident was due to material failure or to operation.

F. W. Stacey Company, now of White Plains, N. Y., has been granted the fourth license to manufacture the gyro for the Avionic Company of America. The gyro, now the registered of the Stacey Engineering Company of Detroit, was designed and built originally by Heald Allen, former associate of the Stacey Engineering Company of America in 1931.

James de Cervo and Harold F. Patterson have been awarded jointly the patent for a gyro compass usually in Philadelphia for outstanding work. Since de Cervo and Patterson filed Feb. 10, 1946, the gyro compass has been used at a rate of six weeks. The new gyroscope is the property of the Pioneer Aviation, which has been placed with the New England Gyro Company, based in Providence of the old Boston Airport Corporation.

## A medal for Dr. Ecker

At a special meeting of the F.A.S. in Paris, Jan. 14-15, the Grand Gold Medal of the Federation, awarded an American, announced that the Federation has awarded Dr. Hugo Ecker for his services to the aeronautical career particularly the trans-Atlantic flights of

the Graf Zeppelin last year. The American delegates presented the name of Dr. Ecker for his record the world flight.

F.A.S. recommendations to be voted on by national state clubs and the International Council of Aeronautics include the suggestion for a system of state control of long-distance flights, so that pilots may receive credit for such distance covered, instead of merely a struggle between take-off and landing phases, also the creation of a world-wide system of control of records for aerobics and aerobics.

Air France, Ltd. has been formed in San Francisco for the manufacture of ships for transportation on the Pacific, with letters 20 ft high and 6 ft wide, are taken below a jet.

Well-knowned but rather hopeless is the record introduction into Congress of the Schiff bill, seeking the appropriation of \$40,000,000 for subsidies to flying ships.

## Personnel

Harold Geyer has accepted appointment as chief air navigation research officer for the Air Corps, War, at quarters for the plane in Washington. R. C. Northrup, formerly manager of Science Aircraft Corporation, is now coming to England as President of the company.

Al Carl Barber, Jr., former manager of the Navy's aviation division, will be vice president of the National Aeronautics Association. Dr. R. C. Northrup, formerly manager of the Science Aircraft Corporation, is now coming to England as President of the company.

Squadron Leader Oswald, leader of the last two Berlin-Schneider teams, has been promoted to the rank of Wing Commander (equivalent to a Lieutenant Colonel in the Army).

The American commercial aviation last year of the oldest and most colorful members Jan. 28, when Edward A. Stinson died of injuries sustained in a crash landing of a biplane and was killed during a landing landing at night at Jackson Park, Chicago. Eddie Stinson formed to fly in 1911, was an important figure in the aviation world.

During the war, was a veteran of all phases of heroism and heroism, and in later years became president of a manufacturer of the Pioneer Aviation which bear his name. He was demonstrating the latest model at the time of the accident.

Charles Tuller Porter, one of the incorporators of the Bell-Island Aircraft Company and for five years vice-president and chief engineer of the Keystone Aircraft Corporation, died Jan. 28, 1951, a short illness. He was particularly interested with the development of the Keystone line of bombers for the Air Corps.

W. F. Bailey, president of the Air Union, died in Chicago Feb. 4.

## SIDE SLIPS

By Robert R. Osborn

ABOUT a year ago, while studying the statistical rise of Aviation we came to the realization that some of our reported statistics were not included, even though the data is now given, was undoubtedly of great value to the industry. There was plenty of data on the following items:

1. Expenditure in currency (not dollar) for all fixed facilities in one particular month last year, but the monthly rise (not dollar) was not given.

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35. Expenditure in currency (not dollar) for all fixed facilities in one particular month last year, but the monthly rise (not dollar) was not given.

36. Expenditure in currency (not dollar) for all fixed facilities in one particular month last year, but the monthly rise (not dollar) was not given.

37. Expenditure in currency (not dollar) for all fixed facilities in one particular month last year, but the monthly rise (not dollar) was not given.

38. Expenditure in currency (not dollar) for all fixed facilities in one particular month last year, but the monthly rise (not dollar) was not given.

39. Expenditure in currency (not dollar) for all fixed facilities in one particular month last year, but the monthly rise (not dollar) was not given.

40. Expenditure in currency (not dollar) for all fixed facilities in one particular month last year, but the monthly rise (not dollar) was not given.

## FLYING EQUIPMENT

A new  
Stinson Junior

**R**ECENTLY announced and made (AVIATION, January, 1932), of the production of a new model of the Stinson Junior, by the Stinson Aircraft Corporation of Wayne, Mich. Although following the general lines laid down by the earlier models, the new machine incorporates certain changes which indicate improvement in speed, stability and passenger comfort.

The principal variations in the design of a new type of landing gear, in which fully streamlined wheels and shock absorbers are carried on the outboard end of small lower wing ribs projecting from the underport of the tailplane. The wing-bracing struts extend outward from the ends of the wing stubs. The overall drag of the undercarriage has been reduced by these changes. The control lines have been changed somewhat, particularly in the shape of the wing tips, which have been rounded off considerably more than in previous models. A new V-type windshield also adds to the streamlining, and affords improved vision for the pilot.

Passenger accommodations have been improved by providing the interior dimensions of the cabin 3 in. in width and 4 in. in depth. Automobile practices have been followed in the disposition and arrangement of seats and fixtures. A layer of balsam wool has been built into the wall to reduce noise, and adjustable safety glass windows provided. Seats are provided for seven flying.

Standard equipment on the model R includes a 225-hp. Leaning engine, rubber-insulated, flexible electric stator, Hamilton Standard propeller; wing type

vapors cowling. Pioneer instruments, sensitive wheels with Tuckson roller bearings and self-aligning brakes; and full navigation and radio lighting equipment, including a 12-volt storage storage battery.

A redesigned  
Privater

**A** NEWLY engineered Privater of successful lander form, but differing widely in detail and construction from earlier models in new redesigning flight but at the plant of Amphibious, Inc. at Roswell Field, L. I. Stranford the hull resembles land plane

rather than conventional flying boat practice. The framing is of welded steel tubing and is designed to carry all stresses without assistance from bottom or side plating. The fuselage, in called upon merely to provide water tightness and to resist localized loads which might cause panicle or straining. The section, which is of modified Vee form, is of 800 in. Alclad built through to water strainers and chain. The side moving, however, free close to the hull, is of fabric, graded from a heavy waterproofed fabric for the portion of the hull below the waterline, up through a medium grade duck, to standard Goss Alclad canvas cutout over the tailplane. The upper part is heavily draped and waterproofed, and here have instead of the canvas is coated in water resistant to leaching and puncturing, thus a metal skin of equal weight. A properly protected canvas is also highly resistant to deterioration from exposure to sea water. The use of a fabric skin also permits the use of double curvature in hull lines to improve aerodynamic properties, without requiring the use of compo-



The model R Stinson



The new Privater

acted and expensive dies for the proper forming of metal and plywood.

At below, the machine is a three-place pusher type monoplane with the engine mounted on a nacelle over the center of the hull. The most marked external change is in the abandonment of the open cut-engine supporting the tail surfaces in favor of a single long-tube boom. The tail boom, which is detachable from the main hull at a point just above the skidgear, is a diamond-shaped girder, consisting of four longitudinal steel tubes, cross-braced at frequent intervals to both vertical and horizontal planes. The rear end of the boom extends out to form the keel, and provides support for the rudder and

applan. The entire lower structure is enclosed within a cylindrical forming of plywood which does not carry any of the stresses or shear loads. The covering is a sand assembly into the shebang at the tail, and into the fin. The wing, which is semi-detached both to the hull and to the engine mount, is of conventional design. The two spars are of wood, ribs and wire are of stainless steel. The cinder and horizontal tail surfaces are also of stainless steel. All surfaces are fabric covered.

The remaining landing gear is similar in external appearance to that used in the old Privater. An engine arrangement supplying high-pressure air from the engine starting system has been developed to permit the power in retracting and extending the wheels. A retractable tail wheel which acts as a water rudder completes the undercarriage. The wing tip floats are of the usual Pioneer construction, fabric covered over welded steel tube frames but have been redesigned to improve their streamlining. An extending lattice is the incorporation of an air leg in the rear strut to protect the rear wing spar in case the floats strike the ground.

The water tight enclosure of the cockpit has been so designed that vision is all directions, except directly to the rear, is practically unobstructed. Cockpit subdivision is a removable panel, making it possible to get at control or to inspect the hull. None of the tubes is materially reduced by a layer of dry-dock in the hull and and automatically leave the engine and propeller.

Engine adjustment is obtained through the use of adjustable control arms, as on former models, although the shape of the arm has been changed somewhat to avoid interference with the action of the elevator.

In the present model the power plant consists of a model A-70 Continental engine of 185 hp. Oil tanks are located in the engine nacelle, and the auto fuel supply is in the hull in a 48-gal. aluminum tank.

Crawford all-metal  
monoplane

**A**SIX PLACE all-metal monoplane has recently been test flown by the Crawford Metalplane Company, Los Angeles, Cal. The machine is of the wing tail cantilever type, the wing being all multi-cellular construction sim-



The new B-14, powered with a 175-hp. Pratt &amp; Whitney engine. Also the Douglas B-7 bomber

ilar to the Junkers design. It is tapered in plan, and the angle of incidence changes gradually from root to tip. The landing is of monocoque construction built up of corrugated aluminum sheet, assembled by riveting. The landing gear is unusual in that large used air wheels are considered one from the under part of the fuselage by means of a short wing ribs. The wheels themselves are completely housed in torpedo like enclosures. The machine is powered with a Wright Whirlwind engine of 220 hp. The general specifications are: length, 42 ft. 6 in.; height, 8 ft. 1 in.; wing area, 248 sq. ft.; gross weight, 3,100 lb.; wing loading, 15.9 lb. per sq. ft.; power loading, 15.9 lb. per hp.

Douglas B-7  
bombardment plane

**P**HOTOGRAPHS have recently been made by the War Department of the new type of bombardment airplane, developed by the Douglas Airplane Company of Santa Monica, Cal. The machine is of the increasingly popular mid-wing monoplane type, powered with two Curtiss Conquest liquid-cooled engines of 800 hp. apiece, being outfitted from the engine in two armament nacelles. Oil coolers and pressure radiators are suspended below each engine.

Fuselage and tail surfaces are all metal, and wings are of the strut-brace type, fabric covered. The armament consists of machine guns fixed and able to be swiveled in both along beneath the fuselage.

A new model  
of the Bird

**R**EFINEMENT at detail and the incorporation of a 170-hp. Jacobs power plant mark the new model C-1 Bird recently completed by the Bird Aircraft Corporation of Glendale, N. Y. Although basically similar to previous Bird models in design and construction, the changes which have been incorporated add both to its performance and its appearance.

The unit power plant idea has been well applied in the new design, with the result that the engine compartment, in ward of the fire wall is unusually well organized. All parts are readily accessible for inspection or adjustment, with a minimum of interference. Before final assembly, the complete engine installation is assembled on a dummy engine mount, and all fuel and oil lines, as well as control rods and levers are fitted to working air.

Another improvement in connection with the power plant is the placing of all fuel and oil lines, as in the pilot's cockpit, instead of trailing them forward and operating by push rods or levers. This arrangement puts the control of the fuel supply directly under the pilot's eyes, and eliminates trouble which sometimes arises where remote control devices are employed.

Changes have been made in the cowlings around the cockpit, to give better fuselage shape, and a new all-metal turtle deck has been added, which incorporates a hinged viewing hood over the rear of the pilot's cockpit to the base of the fin.

The general specifications are as follows: Length overall, 22 ft. 6 in.; height overall, 8 ft. 4 in.; (maximum), 34 ft.; total wing area, 260 sq. ft.; weight empty, 1,450 lb.; useful load, 135 lb.; gross weight, 2,240 lb.; wing loading, 8.5 lb. per sq. ft.; power loading, 13.2 lb. per hp.



The Crawford all-metal plane

## AIRPORT MANAGEMENT

## Remote control for floodlight shadow bar

USE of a shadow bar on the BOSTON (Boston) Airport has been regular practice for several years. Its operation has been simplified by a remote control device developed by Mr. John Berry, airport superintendent, enabling the man on duty in the control room to handle the bar without leaving his post. The control unit consists of a horizontal rod on one end of which is a grip similar to a pistol grip, attached to a vertical and fixed to a horizontal wheel. Around this edge runs the wire cable which on the floodlight end runs through a series of pulleys to the base of the bar itself.

The operator merely aims the horizontal rod at the landing plane as he would aim a gun, following the plane as long as it is on the ground or close to it in landings and take-offs. The pulleys provide the proper leverage to operate the bar which is about an inch wide and as tall as the face of the light.



The shadow bar on Central Airport, BOSTON, can be moved on two tracks and is moved by a remote control unit mounted on the shadow bar in the control room.

The bar drives a shadow which, of course, marks the plane, and permits the pilot to see the airport surface without at any time being actually in the glare of the light. A similar bar is now successfully used at Central Airport, Canada, N. J.

## Joint promotion scheme for airport billboards

THE Sparnacore (S. C.) Airport, a stop at Eastern Air Transport's Richmond-Atlanta line, has been equipped with a sign jointly advertising the company's schedule and a uniformly



The structure and efficient waiting area at Tulsa Municipal Airport. Above: Eastern serves a signboard at Sparnacore Airport.

advertised product. Such installations have been of no expense to the transport company through the cooperation of the local representative of the product advertised. This is a form of joint promotion which has been widely used in other industries.

## A flying field "house organ"

RECENTLY TUPAC at Meadows, L. I., has for some time used weekly a reprinted four-page folder containing news items regarding the activities at the field. This has proved effective in disseminating information throughout all the companies and airport personnel and contractors at the field and to many contacted with the industry in the New York metropolitan area. It has been effective in keeping in touch with some of the newspapers in touch with Roosevelt happenings.

The paper folder has a circulation of about 800 copies which can only about 25 cents per copy to prepare by the newspaper method. It has printed reliable reports of interesting activities of pilots and individuals stationed at the field, special operations undertaken by the Roosevelt company or of operators located there, and other items of "general interest information." It is an effect an airport house organ which may large airports with diversified activities might profitably emulate. The inside spread is devoted to a weekly release for the special benefit of the press. This is sent out each Monday, the front and back pages containing information news local in nature are added on Tuesday and these copies are distributed about the airport.

## Waiting room at Tulsa

THE passenger waiting room at the new Tulsa Municipal Airport administration building. Mark attention has been paid to the interior decorating, which includes benches near each main door depicting progress from old to new transportation modes in the West. Airline ticket offices are located along the side of the main and administration offices are in the four-story tower.

Airline schedules are posted on the large bulletin board at the far end of the room. The entrance to the field and the landing area is at the right under the clock. Waiting tables are provided.

## SERVICING SHORT CUTS

## Emergency hoist for engine removal

FOR emergency removal or installation of engine at Eastern Air Transport shops at Floyd Field, Raleigh, Va., a simple and safe hoist crane may be landed on the emergency track in a very short time. With this arrangement it is possible to handle the Cessna Commander engine of the Cessna as well as the Whirlwind of the Kingbirds. When the crane is not in use, the hoist may be readily disassembled, and the hoist made available for other purposes.

## Dope room ventilating system

AN efficient dope room ventilating system has been installed at seal east by the Airtech shops at San Diego, Calif. A large air fan was built upon the work bench along one side of the room, the intake being a four-foot slot 12 in. high and 3 ft. long, with the exhaust through a circular opening leading to a stack communicating with the outer air. An ordinary air fan was salvaged from an automobile truck and mounted so as to operate in the circular opening between the air box and the exhaust stack. Driven by a 1/2-hp. electric motor this fan forced a large volume of air to the exhaust stack, thus creating a vacuum in the room which is kept slightly below floor level and 12 ft. high.

When doping in this room a door at one end of the room, remote from the venting system, is opened slightly. With the fan operating all air sucked into the system must come directly off the door and since all dope fumes tend to fall to the floor this method serves to keep the room well ventilated.

## A schedule board for shop personnel

THIS assignment of crews to repair jobs at the Pan American Airport, Inc., shops at the International Airport, John St., Miami, is facilitated by the use of an ingenious scheduling board. The board is ruled off horizontally and vertically with white lines. The aircraft servicing operations on both airplanes and engines are listed across the top, one operation opposite each vertical line. At the left hand side the names of the crews are listed, one opposite each horizontal line. The date of a colored thumb tack at the intersection of an horizontal and vertical line in-

dicates the assignment of that particular man to the job indicated. Personnel is made to indicate which shop shift the assignment pertains. A glance at the board at any time gives a picture of the allocation of the entire shop force.

## A one-man tail skid dolly

AT Eastern Air Transport's Atlanta Repair Depot, one man handles Western Mailbuses in and out of the



Shown: Emergency hoist used at Eastern Air Transport shops at Floyd Field, Raleigh, Va. Above: Airtech shops at San Diego, Calif. Below: A one-man tail skid dolly at Eastern Air Transport's Atlanta Repair Depot.

hangar by means of a long-handled tail skid dolly. By pushing the name of the carrier, under the tail post of the airplane and bearing down on the long handle, the tail of the machine is pulled sufficiently so that the tail skid clears the ground, and the machine may be pulled easily around the hangar floor or out onto the apron.

## Spark plug testing apparatus

A TIME and labor saving device for testing badly chartered spark plugs has been developed in the Oakland shops of the Pacific Air Transport

Company. The chief feature of the instrument is that it eliminates the screwing of plugs in and out of sockets in the test chamber, relieving the operator of simple motions of hand and foot which makes it possible to test spark plugs in almost as little time as they can be picked up and laid down by the mechanic.

The test chamber, with a glass observation window in the upper and is open at the lower end, and is fitted with a heavy rubber gasket against which the spark plug is pressed by means of a foot operated jack, effectively sealing the chamber. Air pressure is admitted by the hand operation of a valve lever. Cautions are provided for sealing over rest through the plug when it is in place for testing and the control of electric current is accomplished by means of a button operated with the right hand.

## Safety handles for wheel chocks

RIGID handles 4 or 5 ft. long, welded or bolted to wheel chocks, prevent accidental movement of such wheel chocks well outside the proper danger zone.



airtech



## THE BUYERS' LOG BOOK

### Aircraft thermometer

The Lewis Engineering Company of Niagara, Conn., has recently put on the market a thermocouple-type dialometer for aircraft engine use together with a selector switch to permit readings of temperature from a number of gauges about the engine, using one indicator. Any number of thermocouples up to 16 may be handled by the switch. Both instrument and switch are mounted in standard Army-Navy cases for installation in instrument board.



Above: The Lewis thermocouple. Left: General Electric's new indicator (right) mounted on the engine.



developed in conjunction with Northrop Aircraft, Inc. The new equipment is designed for operation when wheels and slits must be used interchangeably, and where quick changes must be made. Ordinarily the landing wheels must be removed for slitting slits, but with this equipment, the slits replace the wheel in a manual block. When desired the slits can be removed and the wheels rigidly attached to the block without removing them from the axle. The changes back to wheel gear in regular slits, and they are accomplished in a short time. —*Aviation, March, 1932.*

The indicator weighs 1 lb. 3 oz., the selector switch 1 lb. 1 oz., and each 12-1/2 thermocouple weighs 12 oz. —*Aviation, March, 1932.*

### Landing light

The General Electric Company of Schenectady, N. Y., is marketing a type of landing light for aircraft which is installed wholly within the leading edge of the wing, thus offering no additional drag, or disturbing its aerodynamic characteristics. All moving parts are fully enclosed, and the light beam may be directed independently at desired tilt in flight. The ordinary installation includes a 12-volt, 425 watt lamp, which gives a beam of approximately 550,000 sq. ft. —*Aviation, March, 1932.*

### Quick detachable skis

The Federal Aircraft Works of Minnneapolis, Minn., manufacturers of skis for aircraft, have announced a new type of ski gear which has recently been

manufactured by the Hamilton Watch Company of Lancaster, Pa., has been designed to meet such unfavorable conditions.

The hair spring is made of Elmore, a new material, alloy steel of available elasticity, which eliminates any effects of changes in temperature. It is available in the No. 30 case pocket style. —*Aviation, March, 1932.*

### Oil reclaimers

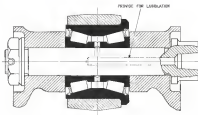
A interesting oil reclaiming plant evolved by the Research Department of the General Electric Company, is being built by the Elmore Corporation of Elmore, N. Y. Three units are available with capacities of 5, 20, and 50 gal. of oil per day. The units are self-contained and are designed to put used oil through two distinct processes, the first stage being clarification by chemical reaction and settling, and the second re-refining by the application of heat at relatively low temperatures. In operation the machine is fully automatic and can be handled by ordinary labor. —*Aviation, March, 1932.*

### Catalogs

**Booster-Bishop Company**—A pocket size booklet describing Rego acetylene welding and cutting equipment, has recently been published by the Booster-Bishop Company of 240 East Chicago St., Chicago. It lists all types of welding and cutting torches, regulators, gas converters, acetylene generators, and their various accessories.

**Torchward Equipment Company**—A new booklet describing Torchward welding and cutting equipment has been received from Torchward Equipment Company, 1000 N. Michigan St., Chicago, Ill. The booklet is designated as "The Blue and Gold Catalog No. 35," and is available on request.

**Math-Bonham Aircraft Corporation**—A bulletin covering standardized aircraft services and parts made from high strength aluminum alloy, has recently been issued by the Math-Bonham Aircraft Corporation of Buffalo, N. Y. The bulletin includes various sizes of damped tubing, bulkheads, pressed collars, and U sections of various forms. Extensive tables giving the service properties of the foregoing are also included.



## NOW—Timken Bearings for Rocker Arms

Here is a rocker arm bearing that will give you the longer bearing life and more dependable rocker arm performance you have been wishing for.

Over 1,600 hours of service have been obtained from Timken Rocker Arm Bearings—and they are still going strong. What the absolute life of the Timken Rocker Arm Bearing may be only time can tell.

**LONGER LIFE.** The tendency to "brinell", or groove, under operating loads is one of the chief causes for the comparatively short life of other types of anti-friction bearings in rocker arms. Timken Bearings have long life due to the line contact of the rolls, Timken tapered construction and Timken-made steel.

**POSITIVE LUBRICATION.** The design of the Timken Rocker Arm Bearing assures an adequate supply of lubricant under all conditions. A high level of lubricant is maintained in the load area where it is most needed. Tight closures keep the grease in and the dirt out.

**A UNIT BEARING—COMPLETELY SELF-CONTAINED.** The Timken Rocker Arm Bearing is truly and completely self-contained. The double row of rolls, inner and outer races and closures are assembled to form a compact unit. It is easy to install and can be removed for inspection, or replaced when necessary, in much less time than is required for other types.

**PERMANENT ROCKER ARM ALIGNMENT ASSURED.** The ability of the Timken Bearing to carry thrust as well as radial loads, combined with the line contact of the rolls, overcomes the tendency of the push rod action to produce lateral wear and looseness. Thus accurate roller arm operation is maintained throughout the life of the bearing.

The Timken Rocker Arm Bearing has already been adopted by one prominent aircraft engine manufacturer. Others are considering its adoption.

It will pay you to specify Timken-equipped rocker arms when buying new aircraft engines. The Timken Roller Bearing Company, Canton, Ohio.

# TIMKEN Tapered Roller BEARINGS



**TEXACO**  
**AVIATION**  
**GASOLINE**  
*-tuned to your  
engine's best*



**TEXACO AVIATION GASOLINE**  
**TEXACO AERODIESEL FUEL**  
**TEXACO AIRPLANE OILS**  
**TEXACO MARFAK GREASES**  
**TEXACO ASPHALT PRODUCTS**

FOR HIGHWAYS, AIRPORTS, FLOORS AND APARTS,  
AND BEST LAYING

EVERY PILOT knows when he has an aviation gasoline that gives him the best in aircraft engine performance. There's the certainty of power, top speed and the feeling of complete dependability in the engine and its work.

That is Texaco Aviation Gasoline. And it is for these reasons that Texaco is so well and favorably known throughout the entire aviation industry—and and recommended by pilots in every section of the country.

Texaco Aviation Gasoline is made to advanced specifications which insure the highest efficiency as an engine fuel. A special grade is used—the most favorable for the manufacture of aviation gasoline—and the manufacture is centered in one Texaco refinery giving absolute control of every step of the process and final uniformity of the product.

Wherever you get it, Texaco Aviation Gasoline is always the same. Complete national distribution makes it available at airports everywhere throughout the United States.

Texaco is a pioneer in developing better aviation fuels and lubricants. Write The Texas Company for information on Texaco Aviation Gasoline and Texaco Aviation Products.

THE TEXAS COMPANY, 133 E. 42nd ST., NEW YORK CITY

## AMERICAN AIRWAYS USES AIRWHEELS on Mail and Passenger Ships



Here are four different types of ships equipped with Airwheels, and there are many more with this same equipment in the great fleet of American Airways, with its scheduled flights of 20,526 miles per day.

With these great, yielding rolling cushions on their landing gear, planes have a new independence over ground conditions, because they can land safely in sand, mud and soft terrain where any other type of equipment would make landings hazardous.

More than this, they reduce maintenance costs, protect planes from many repair charges, such as damage due to ground loops, and give passengers a new feeling of comfort and security in landing and taking.

Only Goodyear builds Airwheels. Only Goodyear can give you Airwheel safety. For full data and engineering recommendations, write or wire Goodyear, Akron, Ohio, or Los Angeles, California.



*When you buy a new ship specify  
Goodyear Airwheels*

**GOODYEAR**

**EVERYTHING IN RUBBER FOR THE AIRPLANE**



**S**INCE September 1930 The Ludington Lines' every hour on the hour New York, Philadelphia and Washington service has become the accepted mode of travel by business executives and men of affairs. In serving so successfully this distinguished patronage, the prestige and popularity of The Ludington Lines indicate an enviable mastery of air transportation. This growing popularity, expressed by a steadily increasing volume of traffic, has necessitated additional equipment . . . Guided by the knowledge and experience resulting from the record of 2,000,634 miles flown, and 87,520 passengers carried since its inception, and by the intimate under-



standing of those comforts and conveniences most appreciated by air travelers, as well as the necessity for greater speed and the rigid economy of maintenance required to facilitate profitable transport operation . . . The Ludington Airlines, Inc.—with the equipment of the world's markets available—chose THE FLEETSTER

and  
**THE FLEETSTER**

CONSOLIDATED AIRCRAFT CORPORATION • BUFFALO • N. Y.



Stanavo-fueled planes of Inter-Island Airways link all Hawaii with a regular monthly flying schedule of 23,000 miles.

The unique, well-established and efficient service of Inter-Island Airways is no less popular among the people of Hawaii than among tourists. Organized but two years ago, its four amphibians and one single-motored

cabin monoplane have carried over 25,000 passengers 600,000 miles. Its schedules have been maintained with practically one hundred per cent regularity.

Like many other lines in the Americas, Europe, and elsewhere, Inter-Island Airways finds Stanavo Aviation Gasoline best suited to its requirements, and uses it exclusively.



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AVIATION GASOLINE  
AND ENGINE OIL

STANAVO SPECIFICATION BOARD, Inc.

Organized and Incorporated in

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222 Bush St., San Francisco

Standard Oil Company (Indiana)  
160 So. Wabash Ave., Chicago

Standard Oil Company of New Jersey  
40 Broadway, New York City

*Up in the clouds ...*



**with an ear to the ground!**

*Exide Aircraft Batteries keep watch over radio . . . make messages certain*

WHEN "soup" swallows up the sun—blots out horizon light—what's when radio and position (navigation) lights must be shipshape.

Exide Aircraft Batteries protect these vital parts . . . give reliable current at all times.

What's more, they're built to fly. Ask your pilot friends. They'll tell you that Exides are light and compact, that the electrolyte will not spill, that they are safe and reliable—that Exide Aircraft Batteries last longer.

We'll be glad to tell you more about the many types of Exide Aircraft Batteries. Just drop us a note today.

#### SEND IT VIA AIR MAIL

During the entire 14 years in which the air mail service have been in operation, less than 1000 of 1 per cent of mail has been damaged.

Dependable Exide Aircraft Batteries, standard equipment on most mail and transport ships, contribute to safety factors.

**Exide  
AIRCRAFT  
BATTERIES**



Contractors to  
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**THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia**  
THE WORLD'S LARGEST MANUFACTURERS OF STORAGE BATTERIES FOR EVERY PURPOSE

*Exide Batteries of Canada, Limited, Toronto*

# SPEEDY Ground Work

Caterpillar Tractor Co., Peoria, Ill., U.S.A.  
Track-type Tractors Road Machinery  
Combines

(There's a "Caterpillar" Dealer Near You)

Prices—F. O. B. Peoria, Illinois

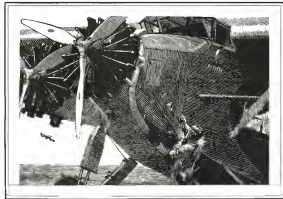
TR	1110	THIRTY	\$1200
FIFTEEN	1140	THIRTY FIVE	\$1300
TWENTY FIVE	1200	FORTY	\$1400
SIXTY			\$1700

MODERN planes provide speedy transportation. And modern tractors—"Caterpillar" Tractors—put speed and usefulness into the ground work. The picture below was taken at Candler Field, Atlanta, Georgia—a similar one could have been taken at scores of other airports, large or small. With a "Caterpillar" on the job, outgoing ships are unsharply, easily swung into position on the runway—incoming ones are promptly trundled into the hangars. Pilots and public alike appreciate the power facilities and efficiency of airports "Caterpillar"-equipped.



**CATERPILLAR**  
INC. U. S. PAT. OFF.  
TRACTOR

## OIL FAILURE Destroys Motors Cuts Power »» Causes frequent costly overhauls



**Tough-Film Pennzoil cuts repairs—  
Costs less per hour of flying time**

**O**IL FAILURE starts when heat thins out poor oil. It leaves moving parts unprotected. It damages every wearing surface—cuts down r. p. m.—wastes power and causes frequent overhauls.

Because Tough-Film Pennzoil is double-refined, it flows freely, yet maintains a safe, tough film at any engine temperature. It penetrates easily into close-fitted bearings, gives protection that increases the period between overhauls. It gives more flying hours between fillings, at lower cost per hour.



Pennzoil is a Pennzoil Company Oil Co. Ltd.

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Executive Offices and Refinery, Oil City, Pa.  
District Offices: New York, Chicago, Los Angeles  
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Quebec and Ontario, Canada.

PENNZOIL is made by the famous Pennzoil Process from 100% pure  
Pennsylvania crude and nothing else.

**RADIO:** Enjoy The Pennzoil Parade every Sunday  
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## WRIGHT ....ENGINE PERFORMANCE at 50° below zero

PACIFIC INTERNATIONAL AIRWAYS OF ALASKA operates a mail route between Nemes and Unalakleet, via the Yukon River. Wright-powered planes are flown daily, over this route, at temperatures ranging from 49° to 60° below zero—but let Pilot Cape tell the story.

"... You may be interested to know how well Wright Motors are operating in temperatures far below zero. Just for proof I am listing below the prevailing temperatures along my route on January 7, 1932. I have checked the temps I make daily, and have never been held up a single day on account of cold weather.

"I am flying a 600 mile mail route, making seven landings and take-offs daily, and I want you to know that the old Wright Whirlwind 300 has never yet failed to answer the

thruster in these exceedingly low temperatures."

Nemes	48 Below Zero	Raley	50 Below Zero
Kahag	55 Below Zero	McGrath	57 Below Zero
Unalakleet	62 Below Zero	Tuktoyaktuk	55 Below Zero

Wright Engines power millions of miles of transport travel every year. Their dependability under the trying conditions of extreme heat and severe cold has made Wright the choice of air mail and passenger operators around the world.

Contractors to the Governments of the World

CURTIS  
Cayman and  
Challenger



WRIGHT  
Cyclones and  
Whirlwinds

**WRIGHT**  
AERONAUTICAL CORPORATION  
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A DIVISION OF CANTIER-WRIGHT CORPORATION



## Three Squadrons of Diving Bombers Now Being Built for U. S. Navy

*New type plane, developed by Martin,  
 heralds a new era in  
 aerial tactics*



Setting new records for bombing plane performance, the swift new Martin Diving Bomber performs loops, rolls, barrelman, inverted flying and other maneuvers heretofore expected only of pursuit planes.



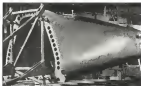
The first Martin Bomber, built in 1918, and perhaps the most famous plane of its kind. This forerunner of a long line of Martin Bombers. These planes possess qualities common to the agile new Diving Bomber of today.



SEVERAL attempts had been made. But no plane ever built before could withstand the terrific strains imposed upon the Martin Diving Bomber in its initial test flight. Diving vertically from a height of 12,000 feet with a 3,600 pound bomb slung beneath the fuselage. Attaining a speed of more than four miles per minute. Pulling out sharply from the dive with the bomb still in place. Repeating this feat over and over again.

That was months ago. Then came a year of rigorous tests in service. Then official approval. Now one squadron of Diving Bombers is being delivered to the United States Navy and two more squadrons are under construction.

Why did Martin succeed where others had failed? Because Martin leaves nothing to chance. A series of brutal tests—surprising nothing ever heard of before—had proved the dependability of every detail before the Diving Bomber took to the air. Nowhere else in the industry can aircraft of equal quality be produced in quantity at lower cost.



Typical of the care which produced the Diving Bomber, a composite reinforced shell type fuselage was built and tested to destruction. The first successful test of a full sized metal-shell body in America.

# MARTIN

Builders of  
Dependable Aircraft Since 1909



The Glenn L. Martin Company  
Baltimore - Maryland

# AIRCRAFT

nimble feet



## BENDIX Wheels and Brakes

Keeping ground efficiency abreast with flying ability are Bendix Wheels and Brakes for airplanes—the pioneer product of its kind, the nimble feet of modern aircraft.

They fully express the Bendix enthusiasm for quality leadership, for progressive development.

Easier control, better maneuverability, greatly increased safety, reduced take-off runs, simplified landing—all these advantages are built into this equipment.

The line is complete; types with roller-bearing wheels (a Bendix development); and low-pressure wheels.



BENDIX BRAKE COMPANY  
SOUTH BEND, INDIANA  
(Subsidiary of Bendix Aviation Corporation)

## BENDIX AIRPLANE WHEELS and BRAKES

Write for literature to Bendix Aviation Corporation, South Bend, Ind., and request

See Also: Circle Data

# Boeing training is built on flying 37 million miles with the Air Mail

THE EQUIVALENT of eight around the world flights, all on 22 crewed aircraft in line, in addition to one million miles of student instruction flying, is an undoubted advantage to be brought you by your flying school.

It means that your training, from the ground up, will be built on fact.

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engines ranging from 165 H. P. to 445 H. P. It compares the most modern Liberator, Curtiss and drops one grouped in one school. Located in California, on the famous Oakland Municipal Airport, it has the advantage of all-year flying weather.

The Boeing School is definitely built to meet the favor of success, backed by the manufacturing and transport experience with the world's largest state in that favor. From the start, it will put you to test the working in your own advantage.

A ballroom of courses, cost, and facilities will be visited you upon request. Compare our courses with those offered elsewhere before choosing your school.

*Next regular enrollment, April 4, 1932*

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School of United Aircraft & Transport Corp.

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Courses: 2 are essential to

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## The first BOEING flying boat outlasted seven engines\*

After nine years of air mail service between Seattle and Victoria—1919 to 1928—totaling more than 500,000 miles, this staunch ancestor of later commercial models was still in air-worthy condition — another instance of Boeing construction years ahead of its time. . . . Boeing Airplane Company, Seattle, Subsidiary United Aircraft & Transport Corporation.



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has always built  
to withstand airplanes  
TO-DAY

LOOK TO ELECTRIC INSTRUMENTS for PERFORMANCE at LOW COST



Here are the G-E engine-temperature indicator and selector switch. By means of the latter, the pilot can read individual cylinder temperatures on the dial of the indicator.

## The G-E Engine-Temperature Indicator and 9-Cylinder Selector Switch

The cylinder temperature of an air-cooled engine is not the temperature of the lubricating oil. Unlike the conditions in a liquid-cooled engine, heating or cooling may take place at a high rate without a corresponding response of oil-temperature instruments. Therefore, the G-E engine-temperature indicator has an important function, for it measures accurately and instantaneously the temperature of any "hot spot" such as a cylinder wall or head. It consists of an indicating instrument connected by small twin-conductor leads to a thermocouple washer used as a spark-plug gasket. This instrument is accurate and reliable; it automatically corrects for changes in air temperature, so that you can be certain of correct readings regardless of altitude or the temperature of the surrounding air. It requires no battery and is not connected to the ignition system. Ask for Bulletin GEA-1187C. Address: General Electric Company, Schenectady, New York.



758-01

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A ship that has proved itself

THE TAYLOR "CUB" has proved its worth in student instruction and private flying and fills an obvious need in Aviation. The low price of \$1325 opens an enormous market heretofore unsatisfied. It is the most outstanding value ever offered—a real airplane with full size, comfortable, dual control cockpit, low pressure tires and standard instruments, built for strength and performance, perfectly stable in every maneuver and an honest landing speed of 26 miles an hour. For these reasons, the TAYLOR "CUB" stands alone in a class which it has made for itself. A full quality airplane for less than \$1325—much less. It is the common sense plane for flying school, flying club, and pleasure flyer alike. Dealers and distributors, don't pass this opportunity by. It is your chance to show a big profit for 1932. Some valuable territory still open. Write or wire at once. Let us help you get order early before the Detroit Show and make the most of 1932.



- Excellent Vision
- Easily Accessible
- Convenient
- Comfortable
- A. T. C. No. 455

**\$1325** FLYAWAY FIELD  
with Continental A-40 Engine  
FLY *Taylor*made AIRPLANES

**TAYLOR**  
AIRCRAFT COMPANY  
Bradford, Pennsylvania





# 110 planes 34 ground stations . . .

equipped with

*Western Electric Radio Telephone*

by **AMERICAN AIRWAYS Inc.**



Flying over 875,000 miles a month, covering 50 criss-crosses from coast to coast and from Canada to the Gulf, American Airways has built up a fine record for dependability.

And Western Electric Radio Telephone—by keeping pilots constantly in touch with dispatchers—has helped to make this record possible.

Along the 9,387 miles of runways over which American operates, 34 ground stations have been equipped with Western Electric Radio Telephone apparatus for guiding and instructing pilots en route. And 110 planes are

Western Electric, equipped—63 for two-way Radio Telephone communication, 47 for receiving radio beacons signals and De postment of Commerce weather broadcasts.

There's Western Electric Radio equipment designed for small planes, too—light, compact and easily installed. For details, write to Western Electric Company, Department 370-A, 195 Broadway, New York.



*Western Electric equipped most of American Airways Air*

**Western Electric**  
Aviation Communication Systems

MADE IN THE UNITED STATES



OF ALL TELEPHONES

\*Western Electric in Canada

FAMOUS FLIGHTS WITH THOMPSON VALVES

# 8

# MILES UP



*This advertisement is one of a series reading historic airplane flights in which Thompson Valves were used*

TO BREAK THE WORLD'S ALTITUDE RECORD



30 degrees below zero in June! Even the most imaginative writer explorer could not match a story like that! Yet a true monster on the wing of his Wright Apache recorded this temperature on June 4th, 1930, when Lieutenant Souch, Indianapolis Navy flyer, set the present world's altitude record for land planes—at 65,166 feet!

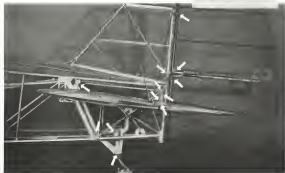
Two hours in the air, climbing steadily . . . Ernst Souch faced his Frost & Whitney Whirly powered engine higher and higher . . . 40 beyond 42,000 feet his propeller began to lose the turning air without taking hold. Wearing a self-developed breathing apparatus and electrically heated goggles, Souch went upward doggedly to the new record—and even in the super-cooled cockpit of the plane his thermometer was registering 38 degrees below zero!

But the 9-cylinder "Wasp" performed faultlessly, adding again to its long list of achievements. And in that engine, at the heart of its smoothly reliable performance, were valves supplied by Thompson Products, Inc.

THOMPSON PRODUCTS, INCORPORATED  
General Office: Cleveland, Ohio, U. S. A.  
Factories: CLEVELAND and DETROIT

**Thompson Valves**

## Plane Controls ...all Ball Bearing



### 100 Fafnirs on new Consolidated Trainer for smoother operation and lower maintenance

**C**ONTROL system, landing gear, axle ends, brake controls, stabilizer adjustments and a majority of the other moving parts of the new Consolidated Trainer developed for the U. S. Army Air Corps feature

new friction-free and service-free on 100 Fafnir Aircraft Bearings. This wide-spread use of ball bearings on a plane of this type demonstrates the fact that the advantages of smooth and dependable operation, elimination of costly servicing, and saving of weight and space made possible with Fafnirs, and not be confined to early ships.

The wide range of types and sizes of Fafnir Aircraft Bearings, including seal and cartridge designs, assures the choice of the correct

bearing for every airplane service. Whether for engines or control systems there is a Fafnir Bearing possessing the proper characteristics.

Plane builders are finding, as Consolidated has found, that with ball bearing applications "troubleshooting is greatly lessened" and "maintenance troubles eliminated."

Fafnir Aircraft Data Sheets contain valuable and practical information concerning load ratings, dimensions, and recommended use.

THE FAFNR BEARING COMPANY,  
NEW BRITAIN, CONN.

Atlanta Chicago Cincinnati Cleveland  
Dallas Denver Los Angeles Milwaukee  
New York New York Philadelphia



*Endorsing quality*

## FAFNIR BALL BEARINGS

# BELLANCA

*will be at Detroit*

WITH NEW ANNOUNCEMENTS

ABOUT BELLANCA PLANES

**B**ELLANCA leadership once more will be asserted at the National Aircraft Show in Detroit. Sales gains and popularity will not be the only basis of this claim. Bellanca performance records will again confirm the superiority of Bellanca planes. The new announcements to be made at Detroit by this company will also provide renewed evidence that Bellanca design keeps always to the forefront, always a step in advance of the needs of air transportation.

If you are considering the purchase of new equipment and comparing values now on the market, it will pay you to wait until you see the 1937 Bellanca exhibit at Detroit, unless you prefer to view these models under construction at the Bellanca factory, New Castle, Delaware, before March 28th, making the trip as the company's guest in one of its demonstration planes.

BELLANCA AIRCRAFT CORPORATION  
New Castle, Delaware Chrysler Building, New York

Bellanca Aircraft of Canada, Ltd., Montreal

# BELLANCA

BUILT AS ONLY BELLANCA CAN BUILD

# SIZING UP *this industry of ours*

THIS year the National Aircraft Show at Detroit, April 2-10, and the Annual Show Number of AVIATION will for most interested people definitely indicate the place occupied by the airplane in the American economic scheme. The business man, the investor, the potential user will, at Show time, critically size up the present-day industry, its products, its leadership and prospects.

For those who attend, the April issue of AVIATION will provide a guide to their general interests and contacts at the Show. It will contain a list of exhibitors, forecast of exhibits, program of meetings and other useful information. In addition it will present a consensus of opinion of current problems by outstanding executives of the industry. The advertising pages will reflect the confidence of prominent manufacturers who serve the industry.

To the thousands who are unable to go to Detroit, the Show Number will be equally interesting. More than seven thousand copies will be printed for subscribers and newsstand buyers.

Advertising forms will close March 18; three days earlier for color.

*Annual Show Number—April*  
**AVIATION**

## 1882 Golden Anniversary 1932 FIFTY YEARS IN THE FRONT RANK OF PROGRESS

In dim geologic ages, Nature created beneath an exclusive area in southwestern Pennsylvania her supreme achievement in petroleum—the rare crude oil containing outstanding lubricating qualities and now known as the "Kendall" Grade. Fifty years ago, Kendall Oil was first refined from this famous crude. Throughout the fifty years since, it has been derived from no other source.

In perfection, Kendall refining processes have been in keeping with the fine quality of the crude. No acids or harmful chemicals endanger the fine goodness of the oil. No expense or effort is spared to make each drop of oil pure, uniform, capable of seasonal service.

During this eventful half century, which has seen the development of high-speed industrial machinery, the automobile and the airplane, Kendall Oil has kept pace with the need for friction-reducing, enduring, efficient



lubrication. Aviation, like other industries, has learned the art worth of Kendall. It has experienced Kendall's abundant fulfillment of every duty.

On its Golden Anniversary, Kendall extends its appreciation thanks to those progressive men and women in aviation, whose confidence and support have led it to new triumphs and greater service.

Kendall Oil is sold at leading airports throughout the nation. Write for the list of these together with complete details of Kendall quality. Address, Kendall Refining Company, Bradford, Pennsylvania.

• • •

Visit the Kendall Exhibit at the Detroit Show—April 2nd to 10th. This happy character "Old Man Kendall" will be on hand to renew acquaintance and answer dipping questions.



The Kendall Refinery in 1882 and a group of its first men—including the inventor. The white building, toward the steam plant, behind it is the "storage tank" crude oil. The two-story steam and water was the only "pump line" from the well.

**KENDALL OIL** REFINED FROM 100%  
BRADFORD GRADE OF  
PENNSYLVANIA CRUDE

Use the Air Mail!

# Do you know that . . .

each month our subscription department receives more than 150 requests for "Back" issues of AVIATION?

♦ ♦ ♦

If we printed extra copies of our monthly issues, we would be glad to comply with these requests, but unfortunately we have no way of knowing in advance just how many of our newsstand readers will "miss" an issue.

♦ ♦ ♦

But We Do Know — that each of these requests indicates a reader has "missed" just the issue he could make valued use of.

*Insure your receiving  
AVIATION regularly by filling in the  
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Here is my check for \$3.00. Send me Aviation for one full year.

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## Long-wearing NICKEL CAST IRON CYLINDERS

*give dependability to  
airplane engines*



Nickel Cast Iron cylinder engine outfit sold by S. GREENE & SONS, Boston, U. S.

**Some important airplane  
engine builders using  
NICKEL CAST IRON**

AEROMARINE PLANE & MOTOR CO.  
BOSTON, U. S.  
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• It's no easy task to produce satisfactory cylinders for air-cooled airplane engines. The light fine cast integral as well as the heavier sections must be strong and dense, without any tendency to chill or become brittle. Machinability and wear-resistance are also highly important requirements. • Nickel Cast Iron... the modern Nickel alloy that is now standard cylinder material in about a dozen important American airplane engines... provides such essential characteristics as uniform hardness, high wear-resistance and good machinability. The possibility of warpage is eliminated... engine performance is improved. • By using Nickel Cast Iron in place of forged cylinders in Beyliner engines, our manufacturer reports that he has saved approximately 80% in the cost of the finished cylinders, while the total engine weight has been increased only 5%.

Our casting operations will gladly discuss your problem with you.



**THE INTERNATIONAL NICKEL COMPANY, INC., 87 WALL STREET, NEW YORK, N. Y.**  
(Works, engines and valves) (Patent, also producers of Nickel Steel)

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to plus or minus .0002

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The illustration shows a Diamond Tool Boring Machine installed in the General Motors shop, where, by its use, precision accuracy of hole diameter and perfect alignment of both holes in piston is obtained.

Rapid reference to extremely close tolerances is made possible on production speed with the Diamond Tool Boring Machine.

**GOVRO  
NELSON  
COMPANY**  
1931 ANTOINETTE-DETROIT



**Where there is no landing  
there must be no failure**

For SPRINGS of any kind, of  
any material, for any purpose  
in motor, controls or landing  
gear, use

**W. D. GIBSON CO.**

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1800 Clybourn Avenue • • CHICAGO, ILL.

Send for our Catalogue



- The lowest priced A.C. ship in America.
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Here are the points—especially they are important—together they are so vital that no one in Aviation can afford to overlook them.

Write today for full information stating whether you are interested in a private owner, dealer or distributor.

**HEATH AIRCRAFT CORP.**  
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Newark Airport, lighted by Westinghouse, America's most air-traffic lights. In center of school, school, and air-traffic lights, and air-traffic lights, and air-traffic lights, and air-traffic lights.

Boston, England, New Landing Field, England.



## Night traffic chooses WELL-LIGHTED airports . . .

**A**ir transport lines select for their stopping points and terminals only those airports adequately equipped to take care of traffic twenty-four hours a day.

And they demand more than just an illuminated field to take care of night traffic—they demand airports whose lighting meets the most rigid requirements.

Whether a field is properly illuminated or not can be determined in a number of ways, but the most important is the opinion of the pilots who use it.

To meet every requirement of twenty-four-hour service and to give your airport the highest standing among pilots, install a flexible system of Westinghouse lighting—a system you can progressively and economically expand for future growth.

THE COMPLETE LINE OF  
WESTINGHOUSE AIRPORT  
LIGHTING EQUIPMENT  
INCLUDES

1. Altimeter or Ceiling Height Indicator
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Quality workmanship guarantees every Westinghouse product

# 215 H P

THE

## Continental

# R-670

425 LBS

APPROVED TYPE  
CERTIFICATEWEIGHT OF  
CONSUME RATING  
215 H P

**The New Continental Aircraft Engine. Standard equipment in 1932 models of 3 of the leading aircraft manufacturers in the United States.**

Weight per h. p. . . . 1.975 lbs.  
Overall length . . . 30 3/4 inches  
Diam. of the cylinder . . . 6 1/2 inches  
Diameter of the crank . . . 6 1/2 inches  
Chromoplate ironproof tappets

This engine will be exhibited in the National Aircraft Show at Detroit, April 2nd to 10th inclusive.

## Continental Engines



Continental Aircraft Engine Co.  
General Offices and Factory  
Detroit, Michigan

IF YOUR PROPERTY IS WORTH OWNING  
... IT IS WORTH PROTECTING



"..there  
was  
Nothing  
to keep  
them OUT!"

**WATCHMAN BLOCK-LOCKED EQUIPMENT**  
**STOLEN**—a newspaper headline today, perhaps a situation that may face you tomorrow.

When your property landmarks are nothing more than lines on a map—how can you keep out the thief that, the private and public make?

Sturdy, unbreakable Cyclone Fence as you have purchased against your property—land and material losses. But that is where its service only begins.

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The unbreakable Cyclone Fence must action keeps in you a race on over for every boundary line problem. Installation made by trained Cyclone men. Write us at once for full information on the design service. Why not now?

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## Cyclone Fence

★ ★ HERE'S NEWS!  
NOW *Direct Reading*  
**ENGINE TEMPERATURE**  
**INDICATOR**

MODEL A25  
(Standard Aircraft Case)

Now you can get rid of cockpit reference thermometers. The new Weston Engine Temperature Indicator, Model A25, automatically compensates for changes in "oilhead" or cockpit temperature. Indicator stays on fixed temperature directly to the cockpit panel. Connections and instructions are clear-cut.

Indicators and "head" are precisely equalized. Weston standard copper mounting plate—standard, as standard temperature of length, breadth, light in weight, result in clear-cut, unobscured readability.

Designed especially for standard engine and engine of aircraft use, the new Weston Engine Temperature Indicator is backed by Weston's forty-five years' experience in the world's leading electrical instrument business. Price for details.

### FEATURES

1. Direct reading—digital Fahrenheit.
2. Automatic compensation for "oil head" variations.
3. Indicator surface is one-piece, unbreakable—non-scratchable.
4. Easy to install—built-in bracket, quick dismount, light weight.
5. Included in standard engine panel.
6. Fits in clock connection.
7. Standard 1/2" standard indicator case.
8. Mounted on standard bracket with accurate support.
9. Mounting bracket is in standard.
10. Light—only 1/2 ounce.
11. Suitable for quick and accurate use in engine mounting.
12. Connections reduced to a minimum.

# WESTON

ELECTRICAL INSTRUMENT CORP.

516 HOLLAND AVENUE ... NEWARK, N. J.

## THE WACO Model A



Convertible into a fully 215 aircraft



● The response to the announcement last month of the new WACO "Model A" has exceeded our most optimistic expectations. Orders already placed—many of them "light aircraft"—make it apparent that we have created what the reader has been waiting for.

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## MODEL "R" FEATURES



Interior of Model "R" shows comfortable, roomy front seat and wide, deep seat belt—new feature standard.



Two winghairs, mounted at low angle, make it easy to land.



Wider doors, wider windows, larger cabin, wider gear—standard features.

## Buyers Acclaim New Stinson Model "R"

Critical buyers, looking for judgment with orders for early delivery, acclaim the 1932 Duxess Model "R" Stinson Biplane, powered by Lycoming, to be the best combination of stability, maneuverability and speed with luxurious interior appointments, exterior beauty and dependable economy

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TO DEALERS: Inventory cleared, low value plane desired by bulk private buyers and operators resulted in stable value of over 200 Stinson Models "S" and "R" during 1931-1932. The Model "S" at its new low price of \$4295, and the Model "R" now in design and performance, retains Stinson's leadership in the cabin monoplane field, and leaves profits to Stinson dealers.

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